THE WORLD OCEAN: INTERNATIONAL PROBLEMS AND AMERICA'S CHOICES

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THESIS

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by

Gary Warren Wilson

Thesis Advisors: R. von Pagenhardt/J. A. Galt

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The World Ocean: International Problems and America's Choices

by

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ABSTRACT

Under pressure of more intensive and diverse uses, the legal principle of "Freedom of Access" to marine resources is no longer sufficient to regulate man's activities in the marine environment. An analysis of the factors which must be considered in designing a workable regime for the future exploitation of the ocean was conducted. Oceanographic as well as political and economic factors are examined, and alternative solutions evaluated as to their ability to satisfy various interests and objective considerations. A recommended formula for the delimitation of coastal state jurisdiction in ocean space and a proposed structure for an International Ocean Authority to regulate activities in the area beyond national jurisdiction are advanced.

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I. INTRODUCTION

When the uses and users of the sea and its resources were few, "Freedom of Access" was a workable legal principle to regulate man's activities in hydrospace. Assumed abundance made restricted access unnecessary. Under pressures of advancing technology and burgeoning population, governments are increasingly aware of the potential wealth and scarcity of marine resources. The concept of "Freedom of Access" is rapidly breaking down. As the uses of hydrospace become more diverse and intense, marine resources are acquiring an economic value making them subjects of conservation, protection and expropriation by individual states [Ref. 1].

Within one year, Canada has established a one hundred mile pollution control zone off her Arctic shores [Ref. 2] and Brazil has claimed sovereignty over a two-hundred mile territorial sea.[1] One may argue that Canada demonstrated insufficient regard for international community action to control pollution, or that she acted rightly to preserve the delicate ecology of the Arctic wastes. Whether noble or self-serving, such unilateral claims by nation-states may sooner

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[1]Reference 3 reported Brazil joining Argentina, Chile, Ecuador, El Salvador, Panama, Peru, Nicaragua and Uruguay, in claiming a 200-mile territorial sea. Brazilian sources were quoted as stating: "...ships will be able to fish only under special licenses to be negotiated with the Brazilian government..... But no foreign fishing at all will be permitted in the inner 100 miles and no fishing for shellfish, crabs or shrimp will be allowed."

or later become customary international law unless actively challenged. Historically, such actions have lead to parallel or even more extensive claims by other states. The Truman Proclamation of 1945 [Ref. 4], which asserted the claim of the United States to the resources of its continental shelf, lead to a host of other's claims not only to shelf resources, but to sovereignty over the shelf itself and, in some cases, the superadjacent waters.[2]

All too often, international law must react to problems which its formulators failed to anticipate. The 1958 Conference on the Law of the Sea, called to provide a stable framework for man's development of marine resources, virtually assured increased tensions by its failure to fix the breadth of the territorial sea and by the use of a flexible boundary condition in defining the legal continental shelf.[3]

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[2]Reference 5 alleges that the Truman Proclamation was motivated by a desire on the part of the United States decision makers "...to provide the legal underpinnings for regulation of the petroleum industry. Such regulatory authority may well have been demanded by the industry in order to guarantee security of investment and in order to secure favorable tax treatment." Reference 5 further asserts that "the Proclamation was carefully circumscribed so as not to give any country a basis for claiming more rights in areas adjacent to their coasts than the United States had claimed in the area adjacent to its coasts." The proliferation of unilateral claims following the Proclamation, and the tendency for states to convert "special purpose" claims to "general purpose" claims are also discussed in Refs. 5, 6, 7 and 8.

[3]The 1958 Convention on the Continental Shelf [Ref. 9], in Article 1, defines "Continental Shelf" as referring "to the seabed and subsoil of the submarine area adjacent to the coast but outside the area of the territorial sea, to a depth of 200 metres or, beyond that limit, to where the depth of the superadjacent waters admits of the exploitation of the natural resources of the said areas."

Thus, unilateral claims and broad, self-serving interpretations of existing law proliferate, as states continue efforts to reserve marine resources to their exclusive use.[4] Often such "land grabs" do not even meet the test of economics, the claimant frequently being incapable of the most efficient production.[5]

Poor law may be worse than no law at all. Rather than limit national encroachment on ocean space, the 1958 Convention on the Continental Shelf, with its vague concepts of "adjacency" and "exploitability", is being used to justify national encroachments.[6] Judicial law established by the

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[4]Two cases in point. Reference 6 mentions the capture by Peru, which claims a 200-mile territorial sea, of a whaling fleet owned by Aristotle Onassis. A $3,000,000 fine was collected, "...despite protests by the United Kingdom in which the vessels were insured and by Panama where they were registered. In this incident two of the vessels were captured 126 miles offshore and the others were taken after escaping beyond the 200-mile limit, the doctrine of hot pursuit even having been successfully applied." The same reference discusses the Sea of Okhotsk, where "...in actual practice de facto sovereignty over this sea as internal waters of the Soviet Union appears to have been successfully established. Fishing therein by foreign nationals e.g., by the Japanese, is controlled by the Soviet Union via the requirement of Soviet endorsement of Japanese Government fishing licenses."

[5]Reference 10 makes the analogy: "In the Cherokee Strip, the rewards went to owners of the fastest horses, not the best farmers. The losers are not only those who might be best equipped to exploit the resources, but also society in that less productive units of capital and labor may be employed."

[6]References 11 and 12 examine the concept of "exploitability" as it pertains to expanding national jurisdiction over seabed resources. Reference 11 points out: "There are those who argue that any coastal state may assert sovereign rights to 'continental shelf' areas beyond the two hundred metre bathymetric contour line if the resources of the zone claimed could be exploited by the application of the skills at the disposal of the world's most advanced state."

decision of the International Court of Justice on the "North Sea Continental Shelf Case" has an ability to compound problems.[7]

Some maintain that ocean space, supposedly lacking vested interests, offers fertile ground for the establishment of an idealistic "Republic of the Deep Seas"; they are deluding themselves [Ref. 18]. No political or legal vacuum presently exists; present law is already being used to extend national jurisdiction over wider areas.[8] Fishermen, mariners, and Naval officers have long been sustained by the sea, and will likely each constitute an interest for a considerable time.

Besides the traditional users of the sea, new and powerful interests are emerging as a consequence of the

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[7] References 13, 14 and 15 discuss the decision of the International Court of Justice relative to the division of the sea-bed resources of the North Sea (Fig. 1). The Court declared: "...the rights of the coastal State in respect of the area of continental shelf that constitutes a natural prolongation of its land territory into and under the sea exist ipso facto and ab initio, by virtue of its sovereignty over the land, and as an extension of it in an exercise of sovereign rights for the purpose of exploring the sea-bed and exploiting its natural resources. In short, there is here an inherent right." (Quoted in Ref. 10 from I. C. J. Reports, 3, 1969, p. 22.) This reference to the "natural prolongation of its land territory" has been used to justify claims to the sea-bed resources of the entire continental margin! [Refs. 16, 17].

[8] Reference 19 reports that the U. S. Department of the Interior has concluded: "...that the Secretary's leasing power under the Outer Continental Shelf Lands Act, read in light of the Convention on the Continental Shelf, extends to an area lying about 40 miles off California in water depths ranging up to 4,020 feet (1,225 meters) with the greater part being in excess of 600 feet (183 meters)."

unrelenting advance of technology. As of 1968, the investment of United States oil companies in offshore petroleum and gas operations amounted to $12.9 billion. The same year, 14% of this nation's crude oil and condensate production came from the offshore [Ref. 20]. The history and projected development of offshore petroleum activities are presented in Figures 2 and 3.

The exploitation of sea-bed minerals other than petroleum is rapidly expanding. References 21-24 examine the broad spectrum of these activities and their potential for future development. Perhaps the most exciting recent advances are those dealing with the possible exploitation of deep-sea manganese nodules, a resource whose development was thought to be far in the future. Deepsea Ventures, a subsidiary of Tenneco Corporation, has recently announced a target date of 1975-76 for commercial operations in this field [Ref. 25].

Coincident with technological advances and the prospect of increased wealth from the seas have come even greater political and social pressures. Freedom of access to marine resources does not insure an ability to share in the wealth [Ref. 1]. Lack of technological expertise and inability to command huge sums of capital effectively preclude participation of developing countries in marine resource exploitation. In addition, accidents of geography constitute a "natural" discrimination. Some states are land-locked, while not all coastal states are equally blessed with wide continental shelves. If we accept the principle of "res communes" as

pertaining to the resources of the seas, then, of necessity, international law in this area must be tempered with equity. The developing nations demand it! The land-locked and shelf-limited nations demand it!

The Maltese initiative of 1967, respecting the sea-bed, is a dramatic example of this drive toward equity in the "Law of the Sea."[9] After widespread debate and exhaustive study by the United Nations, individual governments and private groups: [Ref. 27]

> "...the common heritage has been acknowledged, but the lawyers cannot agree about the property rights."

Unless some form of equitable international agreement is soon reached, it appears obvious that individual states, especially the disadvantaged states, will assert claims unilaterally to what they consider their fair share of the "common heritage of mankind." The consequences of such a lack of world order could be disasterous for man's future (Fig. 4).

The international community is presently engaged in planning for a comprehensive Law of the Sea Conference to

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[9]On 17 August 1967, Malta proposed to the United Nations General Assembly: "the reservation exclusively for peaceful purposes of the sea-bed and the ocean floor and the use of their resources in the interests of mankind." Subsequently introducing the proposal before the First Committee of the General Assembly, the Government of Malta further proposed: "a resolution stating that the sea-bed and ocean floor were a common heritage of mankind and should be used for peaceful purposes and for the benefit of mankind as a whole, that the needs of poor countries should receive preferential treatment from any financial benefits accruing and that claims to sovereignty over the area should be frozen until a clear definition of the continental shelf was formulated" [Ref. 26].

be held in 1973. In this regard, it is unfortunate that Malta's initiative was directed at the "sea-bed and the ocean floor" [Ref. 26]. Although it aroused tremendous interest among policy makers in the future of the world ocean, it tended to focus attention on the sea-bed alone. With the exception of the independent proposal of Elizabeth Mann Borgese [Refs. 28, 29], virtually all planning to date has been directed at regimes for the exploitation of the sea-bed and its subsoil.

Obviously, the sea-bed interacts physically as well as politically with the overlying hydrosphere, and the complexities of these interactions can be both far-reaching and intense. An operator mining or drilling the bottom would be understandably interested in some measure of control over activities taking place "over his head." At the same time, who is to decide whether or not to proceed with the development of a valuable petroleum deposit which just happens to lie in the area of a valuable mid-water fishery (Figs. 5 and 6)? Any oceanographer knows that the oceans constitute a system, with complex and poorly understood mechanisms governing interactions both within the medium and at the boundaries. As such, it must be treated as a system. "Solutions" imposed at one point can have drastic and far-reaching effects unless the dynamics of the whole are considered.

The nature of the marine environment must be taken into account if a truly viable regime for the oceans is to be

forthcoming. For centuries the oceans have served as the ultimate sewer of the earth, yet only recently has man come to realize the dangerous economic and social consequences of indiscriminate pollution. The solubility and diffusivity of many materials are virtually unknown in sea water, yet dumping continues at a constantly increasing rate. The results have often deen dramatic. Reference 30 gives many vivid examples of this progressive deterioration.

In this regard, the potential effects of large scale mining operations on the marine environment are unknown.[10] The necessity of preventing, controlling, and alleviating the effects of possible pollution provide incentives for close regulation of future drilling or mining activities. The economic and social costs of damage by new industries must not be passed on to other users of ocean space.

Thus, by the nature of the requirement, any regime to be imposed on the marine environment must reasonably satisfy the political and economic aspirations of both developed and developing countries, as well as conform to ocean environmental realities. Only in such a way can the development of marine resources serve the best interests of mankind.

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[10] It is well known that heavy siltation is lethal to some marine species. In addition, it can be assumed that a high degree of turbidity would reduce photosynthetic activity in the surface layers, with possible widespread consequences to both earth's oxygen supply and the food productivity of the oceans. Studies into the turbidity produced by various mining methods and the tolerance of marine life to silt have just begun under the auspices of the National Oceanic and Atmospheric Administration [Refs. 31, 32].

An analysis of these factors was undertaken with a view toward determining what system of administration/control over marine activities would best satisfy the requirement for rational development. Details of this analysis are presented in the following sections.

II. THE INTERESTS OF THE UNITED STATES

The seas are of vital importance to the United States. Perhaps no other state is so deeply involved in the entire spectrum of ocean activities. Both the security and the economic well-being of the nation depend on forthcoming developments in the "Law of the Sea." On one particular question, the proper limit of coastal state jurisdiction over ocean areas, various domestic groups have widely divergent interests. These must be carefully evaluated if the balance essential to an optimal policy is to be found.

The analysis which follows profitted from the work of Ratner [Ref. 5], and also reflects information obtained from other sources, including personal correspondence. Specific positions espoused by various individuals and groups are found in Refs. 33-37.

A. MARINE INDUSTRY

1. Fishing

a. Coastal

The coastal fishing industry advocates the expansion of national jurisdiction seaward, the object being the exclusion of foreign competition. Johnson [Ref. 38] estimates that U. S. fishermen are currently harvesting only 10% of the maximum sustainable yield off our coasts, while the take by foreign fishing fleets is only slightly higher. A multiplicity of factors, including the inefficiency

inherent in the fragmented nature of the American fishing industry, make it doubtful that an extension of national jurisdiction would improve the capabilities of our fishermen [Ref. 38]. It is conceivable that foreign competition, operating under proper controls, may actually result in greater benefits to more people from this resource.

b. Distant

The distant-water fishing industry (tuna, shrimp, etc.) advocates narrow limits of national jurisdiction. It roams widely off foreign coasts, and seeks the widest possible freedom to fish. Its activities have brought it into direct confrontation with those nations claiming wide limits of fishery jurisdiction, resulting in seizures, fines, and international tension. As in the previous case, if the coastal fishermen of a state are not harvesting the maximum sustainable yield, there is no biological reason why the benefits of the resource could not be shared under equitable controls.

2. Minerals

a. Petroleum

The United States has been blessed with long coasts and continental margins approximating eight percent of the world total. Because of depth and geology, these areas hold great promise of petroleum production in the foreseeable future. Both the National Petroleum Council and the American Petroleum Institute advocate the expansion of national jurisdiction over the entire continental margin

[Refs. 16, 19 and 39]. By so doing, they apparently reject the argument that an international regime would provide more security of investment for world-wide operations. Put succinctly [Ref. 16]:

> "The National Petroleum Council feels that it has a continuing responsibility to emphasize, as it has from time to time in the past, that adequate petroleum resources are of major consequence to the economy and the security (in its broadest sense) of this Nation. ...The oil and gas resources in these submerged portions of our continent may well prove to be larger than those remaining on the land. These strategic and valuable resources could well be the means of maintaining far into the future this Nation's essential self-sufficiency and avoiding the vulnerability inherent in dependence on foreign energy sources."

Strong support for this position was evidenced by members of the Senate Committee on Interior and Insular Affairs [Refs. 17, 35].

In the interest of objectivity, one should note that what is good, in this case, for the United States is also good for domestic oil companies. An international regime would presumably establish uniform fees and regulations for marine petroleum development throughout its area of responsibility. As long as the oil companies are free to negotiate with individual countries, the possibility of obtaining more advantageous terms with one or another exists. In addition, there would be little incentive for the government to extend favorable tax treatment to offshore production beyond the limits of United States jurisdiction. Such circumstances determine profit margins.

b. Mining

Those individuals and groups concerned with the exploitation of minerals, other than petroleum, favor an ocean regime which will [Ref. 40]:

> "...assure freedom of development in the deep ocean and security of tenure to those engaged in mining on and under the ocean floor."

These same interests, however, oppose an organization which is "unnecessarily elaborate" on the ground that such a system would discourage development of marine minerals [Ref. 40]. From such information as is available, it appears that an International Claims Registry with limited regulatory function would be the authority most acceptable to these interests. Under such a system the preponderance of administrative and regulatory functions would remain under national jurisdiction [Refs. 40, 41].

3. Merchant Shipping

Commercial shipping interests advocate narrow limits of coastal state jurisdiction, the object being maximum mobility for the conduct of international trade. Although the 1958 Convention on the Territorial Sea and the Contiguous Zone [Ref. 42] guarantees the "Right of Innocent Passage" by merchant ships through the territorial sea of foreign states, widespread enforcement of "Pollution Control Zones" and other restrictions imposed by coastal states would seriously curtail mobility on the seas.

B. SCIENTIFIC RESEARCH

The United States is a world leader in oceanographic research. In the conduct of scientific research off foreign coasts, vessels often become subject to the arbitrary regulations of other states [Refs. 11, 12]. In general, the scientific community advocates absolute freedom to conduct research beyond narrow limits of national jurisdiction. However, freedom to conduct research does not preclude international coordination of research activities. Efforts in this area will be discussed in later sections.

C. ENVIRONMENTAL QUALITY

Pollution caused by foreign vessels can have drastic effect on coastal fishing and recreation areas. Many officials and groups advocate expanded national jurisdiction over the waters off our shores as a means of providing greater protection for the coastal environment. They reject the argument that the proliferation of conflicting rules and regulations could cripple world trade, and maintain that the inaction of the international community necessitates unilateral recourse.

D. NATIONAL SECURITY

1. Frontier Security

In the coastal regions of the United States there are many military installations of a highly classified and strategic nature. To prevent foreign intelligence gathering and possible sabotage, as well as provide defense against

submarine launched cruise missiles, there are those who advocate expanded national jurisdiction off our coasts. In this age of ballistic missiles, however, it is doubtful whether such a move would appreciably enhance our security.

2. Military Strategy

As a major power with extensive overseas commitments, the United States must be able to project its military might to remote corners of the world. In order to maximize the effectiveness of our air and Naval forces, military strategy requires maximum mobility. Figure 4 shows the global effect of a general 200-mile territorial sea. The extension of coastal state sovereignty to only 12 miles would place 116 presently international straits under national jurisdiction [Ref. 43]. Such actions would close large portions of air and ocean space to our forces. For this reason, military security of the United States requires the narrowest possible limits on coastal state jurisdiction, and guarantees of free air and sea passage over and through international straits.

3. Foreign Affairs

The United States budget for 1972 authorized $4,085,625,000 for foreign assistance programs [Ref. 44]. According to the "Nixon Doctrine", United States foreign policy for the 1970's calls for a reduction of American presence overseas, with more emphasis on [Ref. 45]:

> "local and regional initiatives, ...national independence and self-sufficiency."

To reduce its presence overseas and yet maintain its

commitment to other nations, the United States will be forced to place even greater emphasis on seapower. A reduced presence would also be served by the establishment of an independent source of international development funds. American foreign policy interests, therefore, would benefit from narrow limits being kept on the national jurisdiction of states over ocean space, and by the international community having an "independent" source of income through royalties on marine resource development.

E. FORMULATION OF "AMERICAN" INTERESTS

Figure 7 summarizes varied United States interests on the question of narrow versus wide limits of national jurisdiction. It must be emphasized that these interests represent the preferences of internal pressure groups. Although even the smallest group may be quite vocal and attract considerable support, it is the interaction between interests which determines overall government policy.

Analyzed in this way, the seeming balance between particular interests rapidly changes perspective. The desire of the coastal fishing industry for expanded national jurisdiction clashes with the interests of our distant-water fishermen.[11]

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[11] The United States, in 1966, extended its zone of exclusive fisheries jurisdiction to a distance of 12 miles from the base-line used to measure the territorial sea [Ref. 49]. This constituted an extension of nine miles over previously claimed limits, and brought the United States into conformity with widespread international practice (Table 1). A further extension by the United States, however, would seriously jeopardize the position of our distant-water fishermen.

Likewise, the preferences of domestic environmentalists conflict with those of our merchant marine. Measures to increase our frontier security through expanded control over activities off our shores would run counter to our strategic (or political/military) concepts, the views of our foreign and military services and the wishes of our scientific community.

Given the principle of reciprocity in international relations, we cannot hope to restrain other nations from imposing the same degree of regulation that we ourselves impose. Thus, it has become United States policy to support international solutions to fishery and pollution problems beyond narrow limits of national jurisdiction [Refs. 46-48]. Further efforts to compromise are apparent in the willingness of the United States to accept an extension of the territorial sea to 12 miles, if coupled with suitable guarantees of free passage through and over international straits [Ref. 48]. The balance of United States interests leans heavily in favor of limited national jurisdiction in ocean space.

The problem, however, is not so simple that the interests of the minerals industries can be disregarded. The economic well being and security of the nation do require the maintenance of a sound energy base and continued development of new industry. Viable government policy requires conflicting interests be resolved, not ignored.

In an effort to meet this dilemma, policy makers have chosen to treat the problem piecemeal. The United States

draft "Convention on the International Seabed Area," submitted to the United Nations on 3 August 1970, would establish as "International Seabed Area" that portion of the ocean floor seaward of the 200-meter contour or 12 mile limit (whichever is farther seaward) [Ref. 50]. That portion of the "International Seabed Area" lying between the landward boundary and the base of the continental slope, however, would constitute an "International Trusteeship Area," in which the coastal state would exercise effective, if not de facto, jurisdiction over sea-bed activities. Article 6 of the draft further proposes:

> "Neither this Convention nor any rights granted or exercised pursuant thereto shall affect the legal status of the superjacent waters as high seas, or that of the air space above those waters."

In this manner, the United States seeks to resolve its conflicting interests with regard to the question of limits of national jurisdiction over ocean areas. The national and international acceptability of such solutions depends on other considerations examined in subsequent sections.

III. THE INTERESTS OF OTHER NATIONS

Detailed analyses of the interests of each of some 140 states eligible to attend the 1973 Conference on the Law of the Sea is a monumental task now underway within the United States government. What is attempted here is the identification of groups of states which share like interests because of similar circumstances. The following summaries are based on the statements of national representatives before the United Nations and other noted references, particularly Ref. 5.

A. SOME GEOGRAPHICAL DETERMINANTS

1 Land-Locked and Shelf-Limited States

The land-locked and shelf-limited[12] countries, numbering over 50, will constitute the largest bloc at the 1973 conference (Table II). Since their share in the wealth of the seas is presently limited, they will presumably seek to limit national jurisdiction and obtain a more equitable share through an international authority over sea-bed resources. The statement of the Delegate of Singapore (a shelf-locked state) to the United Nations Sea-Bed Committee on 17 March 1971, is typical of the position taken by this group. He stated [Ref. 51]:

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[12] Shelf-locked refers to states without immediate access to continental shelf areas. Kuwait and Singapore are examples. Shelf-limited as used here includes those states whose coasts are of minimal extent.

> "...we, the representatives of shelf-locked and land-locked states, cannot afford to be indifferent to the escalating claims by some coastal states to the sea-bed and ocean floor for every such extension of national jurisdiction constitutes an encroachment upon, and a diminution of, the value of our future inheritance."

2. States Having Coasts and Continental Margins of Moderate Size

Forty-one states in this geographical category may choose to go either way on the question of limits to national jurisdiction. The developing countries, especially, are stressing that determination of the type of regime to be established for the exploitation of sea-bed resources must preceed decision on limits to national jurisdiction [Ref. 52]. If they calculate that the benefits from such an international authority would exceed those to be derived from exploitation off their own shores, they will opt for narrow national jurisdiction. If not, they may be expected to advocate wide national limits.

3. States with Long Coasts but Little or No Continental Margins

This group of three states has traditionally favored wide zones of national jurisdiction, the object being exclusive control over fisheries. Peru, for example, leads the world in fishing activity. In 1969, her fishing industry accounted for approximately 15% of the total world catch, while her exports of various fish commodities amounted to $220.5 million [Ref. 53]. In order to protect this valuable resource, Peru claims a 200-mile territorial sea, subscribing to the principle that coastal states have [Ref. 54]:

"the right to establish the limits of their maritime sovereignty and jurisdiction in accordance with their geographical and geological characteristics and with the factors governing the existence of marine resources and the need for their rational utilization."

4. States with Long Coasts and Substantial Continental Margins

Twenty-two states in this category are caught on the horns of a dilemma. The developed countries, like the United States, must weigh all their domestic and foreign policy interests to determine what course to pursue. The developing countries must decide whether the benefits to be derived from narrow limits of national jurisdiction and an international regime for the exploitation of sea-bed resources outweigh those to be gained by national licensing of exploitive activity in an expanded offshore zone. Just as the developing states in Group 2, these under-developed nations want to keep their options open by insisting that an international regime must be decided upon before they commit themselves on the question of national limits [Ref. 55].

Brazil, the United States, and Canada are states whose positions have apparently crystalized on this issue. Brazil has elected to extend its national jurisdiction, adhering to the Montevideo Declaration of 1970 [Ref. 3, 54, 56]. The United States seeks to limit national jurisdiction in ocean space as much as possible [Ref. 48]. The position of Canada lies somewhere between the two above [Ref. 57].

5. States Bordering on "Internal Seas"

Approximately 22 nations border on land-locked or partially land-locked seas. A number of these states have expressed interest in regional solutions similar to that reached concerning the North Sea. They feel that "internal seas" should be left to the development of the bordering states. Italy, for example, having a critical interest in the future of the Adriatic, has asserted [Ref. 58]:

> "...it seems natural that such countries should be inclined to arrive at agreed arrangements among themselves concerning the exploration and exploitation of mineral resources."

6. Archipelagic States

Two states, having land territory made up of a group of islands, adhere to the "Archipelago Theory" of national boundary delimitation. Under this concept, all water contained within a baseline connecting the outermost points of the outermost islands would constitute internal waters of the state. In the case of Indonesia, this would amount to over three million square miles of territory, approximately 700,000 square miles being land [Ref. 7]. The Philippines also adhere to this theory. Because many important sea lanes pass through these areas, their denial as "High Seas" would have a detrimental effect on international maritime activity.

B. SOME POLITICAL/ECONOMIC PREDILECTIONS

1. Perceived Stages of Development

In so far as they exist, the interests of various internal pressure groups within individual nations would,

for the most part, coincide with those in the United States.[13] Because of varying degrees of economic development, however, not all interests represented in the United States are extant in other nations. The result is widely divergent national attitudes toward the preferred outcome respecting the Law of the Sea. Seen in this light, it is logical for Peru (whose economy is heavily dependent on the coastal fishing industry and whose distant fishing, naval, merchant marine and research interests are minimal) to assert her national interest by exclusive control over fishing off her coast.

Inspired by the success of Peru, many other developing countries are seeking to build domestic fishing industries and, thereby, provide desperately needed protein to their growing populations as well as obtain foreign exchange. In most cases, the lack of capital and technological expertise preclude the developing state from any other form of national participation in marine activities. This has contributed to the pre-eminent concern for conserving fisheries,

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[13] There are exceptions, of course. In Ref. 59, a representative of British Petroleum, Ltd. states: "Our view in the oil company is that we go along with anything. It really isn't our business to interfere too much. ...We have to pay royalties to somebody; that is all right. We have to pay it to an individual country, or to a local landowner, or we pay it to this international body; but we must have a good certainty that once we put our expensive money into an operation we can continue doing it without interference and without sudden stoppages." He further states that the oil industry has three requirements of any regime: "security of tenure"; "guarantee that individual industries - individual companies - be allowed to apply for and obtain licenses"; and "reasonable speed in the allocation of the property."

avoiding over-exploitation of the sea-bed and preventing ocean pollution. References 55, 60, and 61 are indicative of this concern.

The potential effects of environmental pollution are no less a vital interest to a state whose economy is largely dependent on tourism. Jamaica, for example, has addressed this issue in the course of United Nations debate on the forthcoming Law of the Sea Conference [Ref. 62].

The economies of many developing countries are heavily dependent on exporting mineral commodities to developed states. The prospect of imminent production of sea-bed minerals is causing widespread concern over the possible adverse effect this would have on the prices of raw materials mined on land [Ref. 56, 63]. Brazil, for example, has proposed [Ref. 56]:

> "Mechanisms should be devised to prevent depressive effects on the prices of raw materials as a result of the exploitation of the sea-bed. A like safeguard should be established to the effect that developed countries must not discriminate in their domestic legislation in favour of the products of their national companies operating in the international area of the sea-bed."

The positions taken by the developed countries reflect their greater involvement in the wide range of ocean based economic activities. Although the statements made by their representatives in the course of United Nations debates may differ in detail from those of the United States, they reveal considerable agreement on substantive issues. They generally seek compromise solutions to the broad range of

ocean problems, recognizing the need to reconcile the interests of coastal and non-coastal, developing and developed states [Ref. 57, 64-66].

Despite divergent national interests, several modalities and principles are widely accepted. The Twenty-Fourth Session of the United Nations General Assembly passed a series of resolutions dealing with problems concerning the Law of the Sea. Reference 67, called for a comprehensive Law of the Sea Conference to be held in 1973. This Conference would deal with the entire range of ocean problems, with a view toward updating existing law. To govern the interim, a "Moritorium" resolution declares [Ref. 68]:

> "(a) States and persons, physical or juridical, are bound to refrain from all activities of exploitation of the resources of the area of the sea-bed and ocean floor, and the subsoil thereof, beyond the limits of national jurisdiction;
>
> (b) No claim to any part of that area or its resources shall be recognized."

By these pronouncements, the international community has sought to prevent further encroachment on the "common heritage", while keeping all options open during ensuing study and debate.

2. Attitudes Toward Management of Resources

The "Declaration of Principles" passed by the General Assembly on 28 January 1971, lays down basic guidelines for an ultimate regime "Governing the Sea-Bed and the Ocean Floor, and the Subsoil Thereof, Beyond the Limits of National Jurisdiction." [Ref. 69]. Although those concrete proposals

submitted to the United Nations to date have dealt exclusively with regimes for the exploitation of the sea-bed [Ref. 50, 70-71], there is growing evidence that many nations consider a more comprehensive approach is necessary. This is apparent in the resolution calling for a comprehensive Law of the Sea Conference, which was passed over the "No" vote of several of the most developed countries (the United States included).

While the United States has attempted to resolve the conflict of interests in ocean space by divorcing the sea-bed from the superadjacent waters, many states are stressing the continuity of interest which extends from surface to bottom [Ref. 55, 60, 63]. The Permanent Representative of Malta to the United Nations, Ambassador Arvid Pardo,[14] recently observed [Ref. 72]:

> "The interests of the Coastal State in ocean space, although varied, are now so interlocked that they should be considered as a whole and a unified outer boundary of national jurisdiction in ocean space should be established."

Given this criterion, it is doubtful that the United States would pursue its own trust area proposal if coastal states were thereby likely to incorporate the superadjacent water and air above the "International Trusteeship Area" [Ref. 50].

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[14] Ambassador Pardo delivered the original Maltese proposal regarding the sea-bed to the United Nations in 1967. Since that time he has attained a position of considerable influence within the community of developing nations.

The international machinery proposed by France for a sea-bed regime is very limited in nature, its stated objective being the promotion of "economic efficiency" [Ref. 71]. The small and developing countries, however, generally favor a strong international authority, with considerable power to regulate and control exploitive activity. They believe that such an authority would best protect their interests and, with the proceeds, promote their development [Refs. 56, 62, 65, 73]. There is already some desire for an international authority empowered to conduct ocean research, systems development and productive operations and, thereby, afford all nations the opportunity to participate through the authority [Refs. 56, 73].

3. Notion of National and Global Security Interests

Since the close of World War II, many states of the "free world" have concluded multilateral and bilateral security agreements designed to deter aggression and reduce subversion. The effectiveness of NATO, ANZUS, and the Japanese-American Defense Pact, to name a few such arrangements, are directly dependent on the ability of the combined naval and air forces to control the "High Seas" areas within their respective zones. To accomplish this end, strategy requires the maximum ability to maneuver and concentrate forces. The more developed states of the "free world" have, therefore, opposed efforts to extend the jurisdiction of coastal states seaward.

The tremendous growth of the maritime interests of the Soviet Bloc since 1945, has resulted in one of the

strange paradoxes of the cold war. The development of a far-ranging naval, fishing, oceanographic research and merchant marine capability has made the Soviet Union, for the first time in its history, a major maritime power. Although the USSR still seeks to curry favor among the developing states by verbal attacks on "colonialists" and "imperialists", her new global interests and intended domination over her satellites suggests her future opposition to seaward expansion of coastal state jurisdiction.

Contrary to the global interests of the developed nations, the developing states are primarily concerned with their frontier security and continued existance. They view foreign vessels (be they military, research or fishing vessels) operating off the coast as potential threats to their security and economic well being. In addition, the fear of being annihilated as innocent bystanders in a nuclear exchange between superpowers is largely responsible for the active part played by the smaller nations on the Geneva Disarmament Committee [Ref. 74]. j It was this same desire to prevent extension of the arms race that aroused such widespread support among the developing nations for the proposal that the sea-bed and ocean floor be reserved "exclusively for peaceful purposes".[15]

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[15]Supra, Note 9

C. VARIANCE AND SIMILARITY OF FOREIGN INTERESTS

Friedheim [Ref. 75] has provided an in-depth analysis of the United Nations Conferences on the Law of the Sea held in 1958 and 1960, from the standpoint of the divergent positions assumed by "satisfied" and "dissatisfied" states.[16] He points out that the "satisfied" tended to consider the conferences as legal forums at which traditional law was to be codified and the fine points debated. The "dissatisfied" expressed general disaffection for existing concepts of international law, and regarded the conferences as political forums at which divergent political and economic interests were to be reconciled by new law. Thus, while the "satisfied" were concerned with preserving the concept of "Freedom of the Seas", the "dissatisfied" were overwhelmingly preoccupied with:

1. the concept of Sovereignty, and especially the desire to extend their Sovereignty over wide territorial seas, continental shelves, and fisheries zones;
2. a distrust for "experts" in various fields, especially experts from "satisfied" states;
3. the demand that international law take their interests and desires into account, and that

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[16] Although "satisfied" and "dissatisfied" in the context of Ref. 75 refers to national attitudes toward the then existing Law of the Sea, the states included in these categories could, in general, also be described as "developed" and "developing", respectively.

they share full participation in the formulation of international law; and

4. a refusal to recognize, as binding on themselves, international law created prior to their emergence as independent states.

The situation is considerably more complex today than it was in 1958. There appears to be general agreement that existing law does not satisfy today's economic and technological realities, and that divergent interests must be taken into account in the effort to find new solutions. In this sense, there is a heavy preponderance of "dissatisfied" states. The basic positions of developed and developing countries, however, are essentially the same.

The developed states, because of their global interests, still seek to preserve the "Freedom of the Seas", while taking a conservative position on the issue of sea-bed resources. The developing countries, meanwhile, continue to show predominate concern for national interests directly seaward of their own coasts. They reject becoming subject to the economic and technical domination of one or another developed country [Ref. 60, 76], and demand their aspirations be taken into consideration by any new regime for the oceans. For this reason, they favor a strong international authority to govern exploitive activities on the sea-bed beyond national jurisdiction.

Whereas the polarization had previously been between "satisfied" and "dissatisfied", we now have a four-way

split. The Maltese initiative of 1967, has resulted in a disparity of interests not only between developed and developing, but between coastal and land-locked and shelf-limited states as well. The land-locked and shelf-limited, in the desire to maximize their share of the "common heritage", might be expected to join with the developed coastal states in the effort to limit national jurisdiction, at least with regard to the sea-bed. On the other hand, developing coastal nations, who constitute the majority of coastal states and are showing increasing reluctance to negotiate resources piecemeal, are likely to resist narrow definitions of national jurisdiction.

Ambassador Pardo of Malta has stated [Ref. 72]:

> "...it is difficult to envisage an internationally agreed outer boundary of coastal State jurisdiction being established at much less than 200 nautical miles from the coast."

He goes farther to propose the division of this area into an "inner zone" in which the coastal state would exercise "quasi sovereignty", with rights established by Treaty, and an "outer zone" where [Ref. 72]:

> "...the coastal State would enjoy preferential but not exclusive rights to resource exploitation."

The above proposal is similar to many other "intermediate zone" concepts previously suggested, including the United States draft sea-bed regime [Ref. 50]. Because of the width of the area suggested, it is quite doubtful that the developed coastal states would ever agree to Pardo's proposal. Without their support no regime would be long viable.

IV. OCEANOGRAPHIC CONSIDERATIONS

Before man leaps into the marine environment with a view toward wresting out its resources, it behooves him to take a close look at those factors which may influence his activities there. These include: the distribution of the resources he hopes to acquire; the nature of the environment in which they are to be found; and the possible problems he may encounter or create in the course of his activities. These factors should also influence the nature of the regime under which he operates, just as they influenced the regulatory regimes established in every other new frontier area man has penetrated in the past.

A. GEOLOGICAL

Geologists commonly divide the earth into two great physiographic provinces, the continents and the ocean basins. Because the volume of water on earth exceeds that which can be contained in the ocean basins, large portions of the continents are submerged. These submerged areas constitute the "continental margins" of the world, and can be differentiated from true "oceanic" crustal material by variations in chemistry and physical structure.

Not all sea-beds, moreover, contain "oceanic" crustal material. Many "marginal seas" are in fact no more than great depositional basins or depressions in the continental margin, and are everywhere underlain by "continental" crust.

The Caribbean, North Sea and South China Sea are examples of such "marginal seas" [Ref. 23, 77].

The continental shelf is generally considered to be that portion of the continental margin landward of a point of marked increase in the slope which descends to the floor of the ocean basin. The shelf itself slopes gently seaward, and constitutes a submerged platform bordering the emergent continental land mass. Reference 78 provides considerable detail on the continental shelf areas of the world. It points out that whereas "the average depth of the shelf edge is at 133 meters with an average width of 40 miles", wide variance from these average values is the general rule. In many areas [Ref. 78]:

> "...the shelf edge is indistinct and is more of a zone than a definite line."

Since such wide variation in the geographical continental shelf exists, any uniform lateral limit to the continental shelf constitutes a political rather than an oceanographic boundary. As such, its legal delineation will depend solely on a compromise among the interests of states.

1. Distribution of Mineral Resources

McKelvey and Wang [Ref. 23] point out that fundamental geological differences between continents and ocean basins have direct bearing on the types of mineral resources to be found in each area. The continents are overlain by thick accumulations of sediment. These sediments extend out over the continental margin and underlie the marginal seas. In many areas the accumulation is several kilometers thick.

In contrast to the continents and continental margins, the crust underlying the deep ocean basins is relatively thin. Sediments here are also thin, being at most several hundred meters to a few kilometers in thickness.

a. Petroleum

A United Nations report [Ref. 79] has observed that the most important requirements for hydrocarbon formation and accumulation are:

> "...source beds with abundant organic matter, reservoir rocks, and a favourable history of sedimentation and structural development resulting in structural and stratigraphic traps."

In addition, Schneider [Ref. 80] points out that under normal conditions sediment thicknesses of 15 to 20 kilometers are considered necessary to provide the geothermal heating necessary for petrochemical cracking. The same reference, however, suggests that favorable conditions can also be found in regions of somewhat less sediment thickness but anomalously high geothermal gradient. Such conditions exist in narrow but growing basins like the Red Sea.

In either case, sediment layers at least several kilometers thick are known to be basic to petroleum formation. Figure 5 indicates those areas having sufficient thickness of sediment to contain possible petroleum resources. In general, these areas include the continental margins, marginal seas and internal seas like the Black Sea and Hudson Bay. Petroleum deposits are also theoretically possible in the continental rises of rifted continental margins like that off the east coast of the United States

[Ref. 80]. Because the sediments of the deep ocean basins are relatively thin and undeformed, these areas are generally considered to have little petroleum potential [Ref. 19, 79].

b. "Hard" Minerals

The weathering and erosion processes acting on the continental land mass result in large quantities of minerals being carried to the sea by stream and river run-off. These minerals are distributed over the continental margin, the coarser material settling out closest to the land and the fine farther seaward. Periodic slumping and turbidity currents further distribute this land derived sediment over wide areas. Reference 77 reports placer deposits of gold, tin, diamonds and other minerals having been discovered on the continental shelves of various countries. The same reference lists sand, gravel, shells (used in the manufacture of cement), sulfur, salt, and phosphorite (a mineral having potential as a source of fertilizer) as being found in continental shelf areas.

Since the bed-rock of the continental margin is the same as that of the adjacent land, the minerals found in the land can also be expected to occur off-shore. Reference 79 indicates that vein and lode deposits of coal, iron, tin and other metallic minerals are known to extend under the sea in many areas.

Highly concentrated metalliferous sediments are known to exist in the Red Sea. These are found in deep (approximately 2000 meter) basins, and are believed to be

the result of precipitation from hot hydrothermal anoxic brines formed when sea water comes in contact with submarine volcanic magma. The sediments have high copper, zinc, lead, silver and gold assays, not to mention iron, manganese, mercury and other metals [Ref. 79].

The crust of the deep ocean basins is composed primarily of basalt, as opposed to the granitic rock of the continents. It is extremely unlikely, therefore, that vein and lode deposits are to be found in the deep ocean bed. The sedimentary layer consists primarily of red clay and calcareous and siliceous pelagic oozes. Surficial deposits of manganese nodules are also found. These nodules are apparently precipitated from sea water, but the process by which they form is unknown. They contain manganese, nickel, cobalt, copper, molybdenum, zinc and many other metallic elements. The ratio of the constituent metals varies from ocean to ocean, and within any given ocean. In general, however, nodules having the highest percentage of the more valuable elements (Cu, Co, Ni) are found in the deepest water [Ref. 79].

2. Prospects for Development

Petroleum presently constitutes approximately 90% of the total value of subsea mineral production. Although the mining of placer and bed-rock deposits is in progress in many areas of the world, total annual production from these sources amounts to less than 1% of onshore mineral production [Ref. 23]. Further expansion of "hard" minerals operations

will depend heavily on geological, technological and economic events.

Offshore placer deposits are normally found in conjunction with adjacent land deposits. Although many areas of the world hold promise for development, evidence exists that deposits of economic importance are likely to be limited to local shelf areas less than 160 meters deep [Ref. 79]. This is well within presently recognized limits of national jurisdiction.

Present underground mining efforts are limited to undersea extensions of mine shafts sunk ashore, and sulfur extraction by the Frasch process. Undersea shaft mining has taken place for hundreds of years, with over 100 mines extracting coal, iron ore, nickel, copper, tin and limestone to date [Ref. 79]. Sulfur extraction from salt-dome deposits is undertaken from structures similar to those used by the offshore oil industry, and currently yields about 20% of total United States production [Ref. 23]. In order to initiate underground mining in areas of the continental margin far from land, however, two developments are necessary: the detailed geological mapping of the area to reveal the location of promising deposits; and the development of a technique for deep water extraction of bedded deposits. Both of these efforts are in their infancy [Ref. 77, 79].

Of all the mineral deposits known to exist on or in the continental margin, petroleum shows the most promise for

expanded development in the immediate future [Ref. 23, 77, 79]. This development includes not only increased economic value, but expanded depth capability as well. It has been estimated that offshore petroleum will constitute 33-35% of total world output by 1980 [Ref. 23, 79]. Operations as deep as 1500 meters are expected to be feasible by the same year [Ref. 19]. The development of new survey techniques [Ref. 81], use of submersibles for underwater operations [Ref. 81, 82], employment of mobile drilling ships and rigs [Ref. 19], and construction of underwater production systems [Ref. 83], will make operations at even greater depths technically possible in the foreseeable future.

It is economic feasibility, however, that will govern the rate and extent of offshore petroleum development. Current estimates of the price of oil extracted from oil shales range from $4.00 to $5.00 per barrel [Ref. 80, 84]. This effectively sets an upper limit to the price of crude oil produced from wells. Since the costs of offshore operations increase almost exponentially with depth, it is possible that a point may be reached beyond which further development, though technically possible, is either economically unfeasible or limited to unusually large fields [Ref. 19, 20].

Although Reference 85 reports one American and one German firm are investigating the commercial feasibility of exploiting the Red Sea metalliferous sediments, maganese nodules are the deep sea mineral resource showing the

greatest promise of imminent exploitation. A number of firms are presently active in this field. Reference 86 reviewed the effort of Kennecott Explorations, Inc. to map geologically and assay various nodule deposits. In late 1970, a Japanese firm successfully recovered nodules from a depth of 3,760 meters in the Pacific using a "continuous line bucket" dredge system [Ref. 85, 87].

In the United States, Deepsea Ventures, a subsidiary of Tenneco, Inc., has developed both a recovery and a refining process for manganese nodules. The recovery system, described in References 88-89, was successfully tested in approximately 3000 feet of water in July 1970. The refinery, using a continuous flow hydrometallurgical process, is presently undergoing pilot-plant testing in Virginia. Recovery of 95% of the manganese, nickel, copper and cobalt has been reported, and efforts to extract other metals are continuing. Deepsea Ventures is presently attempting to organize an international consortium to finance full scale production from one million tons of nodules by 1975-76. Total outlay necessary to achieve full production is estimated at $200 million [Ref. 25]. To be economically feasible, this operation would require, as a minimum, a 20-year lease on a 1000 square mile area of sea-bed having sufficient nodule density. Several suitable locations have been selected in the Pacific [Ref. 90].

Using nodule assays from a prime candidate site in the Pacific, Deepsea Ventures has estimated that a one million

ton per annum operation would produce 12,600 tons of nickel; 10,000 tons of copper, 2,400 tons of cobalt; and 260,000 tons of manganese [Ref. 25]. Based on statistics for these minerals reported in Reference 91, one company producing one million tons of nodules per annum would produce approximately 3.5% of the manganese; 0.2% of the copper; 14.6% of the cobalt; and 2.5% of the nickel produced by the entire world in 1967. Since the world demand for metals is constantly increasing, it is possible that this level of production could be absorbed by the world market without serious price drops occurring. Based on 1967 prices, the total market value of the metals would be $58,390,801. Assuming a 10% tax on the gross value, income to a hypothetical international agency from the operations of this one company would be approximately $5,840,000.

Because of the high initial investment required, the commercial exploitation of manganese nodules is likely to remain a limited entry industry for a considerable time. Operations by even ten companies at the level of one million tons per year, however, might cause serious world price dislocations. The overall effects will depend on the amount of increased demand for the metals concerned, which in turn is dependent on the development of new uses, discovery of additional sources, and the state of the overall world economy. Even assuming prices could be maintained at the 1967 level, a tax on the production of ten million tons would net an international agency only about $58,400,000.

Although a considerable sum, this amount falls far short of that required to improve measurably the status of developing countries.

The only other minerals industry showing imminent prospects for expansion beyond the 200-meter isobath is the petroleum industry. McKelvey [Ref. 92] points out that petroleum leases since 1954 have brought $4.4 billion into the United States Treasury alone. This amounts to about $260 million per annum. If one of the primary objectives of an international regime for exploitation of the sea-bed is the maximization of funds for international development, this objective would best be satisfied by including under the international regime the maximum amount of area favorable for petroleum development (Figs. 5, 9). Since these areas are limited to the continental margins, marginal seas and internal seas, such a system would require the stipulation of narrow limits for coastal state jurisdiction.

B. BIOLOGICAL

Latest estimates of the maximum sustainable yield of living resources from the oceans range from 180 million to two billion metric tons annually [Ref. 93]. The total world catch in 1969, however, amounted to only 63.1 million metric tons [Ref. 53]. Using the most conservative estimate, it becomes readily apparent that mankind is presently utilizing only about one-third of this potential resource. When one considers that the 1970 total value of fish, shellfish, and other aquatic plants and animals caught by United

States fishermen alone was $602 million, it becomes obvious that the rational development of these living resources could do much to satisfy the economic, as well as the nutritional, needs of the world [Ref. 94].

Many of the problems related to fisheries development are a direct consequence of the nature of the resource. Considered "common property", the living resources have traditionally been exploited in accordance with the principle of "Right of Capture". This "first-come, first-served" or "finders keepers" approach has often lead to economic waste and inefficiency, resulting in overfishing in some areas and underfishing in others [Ref. 1, 10]. Despite the advantages to be gained from rational management (including restricted entry, catch quotas, etc.), fishermen have traditionally opposed any form of regulation which would limit their share of the catch. International fisheries commissions presently in existance lack the authority to take independent action on fisheries problems. They can only recommend to member governments a preferred course of action. The failure to take effective national action, despite repeated warnings by the International Whaling Commission, has resulted in the virtual extinction of several species of Antarctic whales.

Rational management and maximum utilization of resources are also frustrated by the unilateral expansion of coastal state fisheries jurisdiction. Peru, for example, claims a 200-mile territorial sea, and has seized the boats of other

nations fishing for tuna in these waters. The majority of Peru's domestic fishing effort, however, is devoted to the taking of anchoveta in coastal waters [Ref. 38, 95]. In the opinion of an oceanographer serving with the United States Marine Fisheries Service [Ref. 96]:

> "At least 90% of all Peruvian anchoveta and tuna fishing takes place within 50 miles of the coast."

Obviously, Peru seeks to protect her interests by reserving the large tuna population farther off her coast for the future expansion of her own fishing industry. Whereas such considerations might be valid for "one-time only" resources like minerals, they are invalid for renewable living resources. In the absence of fishing, natural processes, such as the competition for available food, tend to maintain the population within stable limits. To the extent this resource is not presently utilized, therefore, it is wasted.

Figure 8 illustrates the intensity of fisheries exploitation in 1963. Although world fishing activity has increased markedly in the interim, much of the data represented in this figure still holds true. Exceptions include the Peruvian anchoveta fishery, which, having apparently reached the maximum sustainable level of exploitation, has been limited by government imposed seasonal quotas since 1965 [Ref. 95]. Schaefer and Alverson [Ref. 98] point out that the demersal fish (flounders, sole, halibut, cod, etc.) are the most heavily exploited community at present. Many demersal species exist, however, which remain virtually

untouched. This is especially true of many species of crustacea, which show great potential for commercial development [Ref. 98, 99]. The pelagic fishes (tunas, sardines, jacks, etc.) are presently expoited far below their world-wide potential. Some experts estimate only 5% of this resource is presently being utilized [Ref. 98].

Technology has made possible world ranging integrated fishing fleets, the development of fish protein concentrates as dietary supplements, and the promising new field of marine pharmacology. All these activities have one thing in common: a dependence on a continuous supply of raw material. Any event in hydrospace which disrupts this supply, be it over-fishing or dissipation through pollution or distruction of hatcheries, nullifies the benefits otherwise obtainable. Efforts to protect and conserve living resources through the expansion of national jurisdiction are, at most, ineffective. Fish recognize no national boundaries, many species migrating thousands of miles in the course of their life cycle. The very species that Peru seeks to protect, the Skipjack Tuna, is known to spend much of its life in the central Pacific [Ref. 100]. Overfishing in the central Pacific spawning ground would dash any hope Peru has of developing a tuna fishery within 200 miles of its coast.

It is obvious that the interests of coastal states having economies heavily dependent on fishing must be taken into account. Nevertheless, the full potential of the living resources of the seas can best be realized by the application of effective "range management" techniques on an

oceanic scale [Ref. 98]. Since living resources respond to environmental stimulli, we must determine what factors (diet, physical parameters, etc.) enhance population growth, and prevent disruptive occurrences. Harvesting must be based on the maximum sustainable yield for each species and each area, with due consideration given to the effect the harvesting of lower species might have on those higher in the food chain. In short, the ecology of the entire marine environment must be considered.

Definitive answers to these questions will require a tremendous amount of scientific data and study. International fisheries commissions, the United Nations Food and Agricultural Organization, and scientific institutions around the world have long been active in this regard. Also required, however, is a level of international cooperation and coordination in exploitation heretofore unknown. The living resources of the sea are also part of the "common heritage of mankind". Without international coordination, optimum development of these resources is impossible.

C. PHYSICAL

While even the most primitive of peoples can recognize the interface between atmosphere and water and land and water, relatively few "educated" people realize that the water which covers more than 70% of the globe is not a homogeneous mass. Wide variation in salinity, temperature, and dissolved gas content results in both horizontal and vertical inhomogeneity. The oceans are stratified. Varying

density results in layers having different physical properties, along the boundaries of which "internal waves" are known to propogate. Density effects drive horizontal and vertical circulations over large areas.

In the last century it was commonly believed that the waters at great ocean depth were totally devoid of movement and organic life. With the advent of deep bottom samplers, underwater cameras and manned submersibles, however, it became obvious that life exists at all depths. What's more, the observation of ripple patterns on the deep sea-bed made it obvious that currents of considerable velocity do occur along the bottom. Sampling and identification of water masses by salinity and temperature characteristics lead to the realization that water formed in one area may spread over great distances. The deep and bottom water of much of the world ocean has been traced to its point of formation on the continental shelf of Antarctica [Ref. 101].

Whereas meteorology has progressed beyond the descriptive phase to where it now seeks to predict atmospheric events, physical oceanographers are still trying to describe many of the processes and interactions at work in the marine environment. A glance at an oceanographic atlas with its neat representation of currents is misleading. Although the general circulation of the oceans and its relationship to the circulation of the atmosphere are fairly well established, the details in time and space are virtually unknown. A value of local current velocity extracted from an atlas may

have no resemblance in either direction or magnitude to values subsequently observed. Perturbations from mean conditions caused by the constant interaction of planetary and local influences like the wind field, the mass distribution, the temperature distribution and the bottom topography are poorly understood at present. The Gulf Stream is one of the most intensely studied oceanic areas in the world; yet, although descriptions and theories explaining its behavior are available, no one has succeeded in constructing a detailed mathematical model of its circulation [Ref. 102].

Currents are not the only phenomena still requiring definition. The mechanisms of air-sea interaction which produce waves, including the anomalously high "storm surges" associated with hurricanes, have yet to be fully determined. Just as vital is an understanding of the processes by which waves propogate and eventually die out, and by which other physical parameters become subject to change.

The objective of the physical oceanographer is an ability to use his understanding of ocean processes to make predictions of oceanic events. An ability to predict waves alone could save millions of dollars and countless lives each year by timely warnings to ships and coastal areas. Current predictions are vital to adequate pollution control. Accurately predicted temperature and salinity distributions would facilitate the location of fish stocks, many species being known to prefer fairly narrow limits of these parameters.

Even though our understanding of fundamental ocean processes is limited, efforts at environmental prediction have begun. The United States has funded $145,197,000 for the Marine Environmental Prediction (MAREP) Program in fiscal year 1972 [Ref. 103]. Other countries have also instituted national programs. A truly effective environmental prediction system, however, requires real time data collection, storage and retrieval on a global scale. Because of political and economic realities, such a system is obviously beyond the capabilities of any one nation. The United Nations Intergovernmental Oceanic Commission has proposed an Integrated Global Ocean Station System (IGOSS). This system would operate in close conjunction with the World Weather Watch of the World Meteorological Organization to provide information and forecasting services on a global scale [Ref. 104].

A cooperative effort such as IGOSS can have dramatic impact. Since all activities in ocean space are dependent in one way or another on the state of the environment, an international oceanic prediction system can do much to promote the rational development of marine resources, while contributing to the protection of both man and the environment.

D. POTENTIAL PROBLEMS

As activities in the marine environment become more intense, the problem of resolving incompatible uses of the same area will increase proportionately. This is especially

true of those areas, like the continental margin, having a multiplicity of potential uses. It cannot be assumed that any one activity will not influence, or itself be affected by, other activities in the same region. Reference 105, for example, mentions the sad history of a multi-million dollar telephone cable recently laid between South Africa and Lisbon. The cable was implaced without apparent realization of the intense trawling activity along its route. Such cases are a direct consequence of a lack of communication and coordination at the international level.

Article 5 of the Convention on the Continental Shelf establishes the right of the coastal state to establish "safety zones" of up to 500 meters around installations constructed on its shelf [Ref. 9]. As long as activities were confined to shallow water and structures extended above the water surface, this concept proved workable. As operations extend to deeper water, however, and completely submerged production facilities come into greater use, problems of coordination between multiple uses of the same area are bound to increase. Submerged installationswhich project into the superadjacent waters constitute a potential hazard to fishermen and shipping. Adequate safeguards must be taken.

Beyond limits of national jurisdiction, however, this problem takes on new proportions. Freedom to exploit the mineral resources of the sea-bed is not one of the "Freedoms of the High Seas" recognized by the United Nations Convention

on the High Seas [Ref. 106].[17] What's more, there is no basis in international law for the establishment of "safety zones" around ships drilling or dredging for commercial purposes in international waters. The same applies to submerged installations constructed on the sea-bed. Although an entrepreneur would understandably desire to exercise some measure of control over the area around and over his operation, such control constitutes an infringement on the rights of others and to date has no legal justification. Advancing technology has resulted in a number of other "grey areas" in existing international law. The legal status of submersibles engaged in construction, salvage or other operations on the bottom is subject to question. So too are unmanned environmental data buoys anchored or drifting in international waters.

Perhaps the greatest effect of intensified use of ocean space is the increasing incidence of environmental pollution. Since "one man's waste is another man's pollution," this too constitutes a problem of reconciling alternative uses. Because ocean currents can distribute the effects of pollution over wide areas, however, this problem takes on much greater significance than the problem of competition for local areas.

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[17] Recognized freedoms are [Ref. 106[:
"(1) Freedom of navigation;
(2) Freedom of fishing;
(3) Freedom to lay submarine cables and pipelines;
(4) Freedom to fly over the high seas."

As pointed out in Section IV, C., our knowledge of the time and spatial perturbations of mean ocean circulation patterns is limited. Stommel has observed [Ref. 107]:

> "From the scattered pieces of evidence that are at present available it appears that the dynamics of the oceanic circulation, and the transport of various properties in the sea, may actually be dominated by the large scale, transient, turbulent processes which hitherto have been ignored by observers, and which theoretical workers had hoped to bypass."

While the processes are poorly understood, the effects are all too obvious. In many areas density stratification inhibits mixing of water masses and dispersion of pollutants. The result is high concentration of the pollutant in a particular water mass. This phenomenon has been observed in the coastal waters of the United States [Ref. 108].

Pollution is actually a result of preoccupation with production as an end unto itself. The wastes which occur as a by-product of any production process have traditionally been disposed of at the least possible direct cost to the producer. When the waste is harmless this is beneficial, since it results in lower prices for the consumer. When the result is environmental deterioration, however, it means that the cost burden has only been shifted from the producer to society as a whole [Ref. 108].

The problem arises: What wastes constitute an environmental hazard? The Consultative Assembly of the Council of Europe has taken the position [Ref. 109]:

> "...the absence of fundamental oceanic research should be a reason for extreme caution rather than a pretext for dumping dangerous waste into the sea."

Carrying this proposition one step further, others have recommended [Ref. 105]:

> "...shifting the burden of proof from those who could be hurt by pollutants to those who are doing the polluting; that is, the polluters should be made to provide reasonable proof that their activities are harmless."

The incentive to shift the burden of proof is especially strong in relation to new users of ocean space. The problem arises, however, of reconciling the need for complete assurance of safety for the environment with the unwillingness of the entrepreneur to release zealously guarded "proprietary information" concerning his projected area of operations. This has long been a problem in offshore oil exploitation. Following the oil well blowout in the Santa Barbara Channel in 1969, the efforts of the United States Geological Survey to evaluate the situation were seriously hampered by a lack of geophysical data. The oil companies had the data, but did not release it until Secretary of the Interior Walter Hickel personally stepped in and requested it [Ref. 110].

The mining of surficial deposits at sea, whether it be manganese nodules at great depth or deposits in shallower water, can also have widespread environmental consequences. Methods proposed to date have relied almost exclusively on dredging techniques. Experience in shallow water, however,

has shown that dredging operations in one area can result in shoaling in other areas due to the large amount of fines stirred up and carried away by currents. Agitation of sediments can also result in previously precipitated chemical compounds being thrust into solution again [Ref. 108].

Whereas shoaling per se would not be a problem in deep water dredging operations, a large quantity of fines placed into suspension could have even more serious effects. They could settle back into the area of excavation, burying the desired surficial deposits and, thereby, increase operating costs. Should the turbidity reach the surface layer, it would increase light attenuation and result in decreased photosynthetic activity. Since the ocean food chain is based on the primary productivity of the phytoplankton, this could have serious impact on living resources in the area. If these fines did not reach the surface, but became entrapped by density stratification, they could be carried long distances by currents before settling to the bottom. A particle four microns in diameter has a settling velocity of only about one meter a day [Ref. 101]. Particles up to the size of fine sand are known to have been transported large distances in a strongly stratified ocean [Ref. 111].

There is little doubt that benthic organisms in the immediate area will be destroyed by the dredging operation itself. In addition, suspended material may be spread over large areas by bottom currents, resulting in the burial of

even more benthic life. Since demersal species are largely dependent on the bottom for food, the exploitation of sea-bed minerals could have an indirect effect on fisheries based on these demersal species. More directly, any toxicants introduced in the course of shipboard beneficiation processes or as a result of sediment agitation could result in destruction of all living resources over a wide area [Ref. 99].

Shifting the burden of proof to the entrepreneur in the case of sea-bed mining operations would require him to present evidence that no part of his operation constitutes an inherent environmental hazard. This would necessarily include not only immediate local effects, but more extended "downstream" effects as well. Precedents for this type of requirement are known. Prior to granting Dillingham Corporation a license to mine aragonite by dredging off Bimini, the government of the Bahamas required an "uninterested party" ecological survey of the area. No objection being found, operations were commenced under the condition that the area be continuously monitored to detect deleterious ecological effects and that "buffer zones" would be established where necessary to protect the environment [Ref. 112].

For areas beyond limits of national jurisdiction, international solutions to the problem of pollution are necessary. Because of the intimate relationship between sea-bed minerals exploitation and the living resources of the superadjacent waters, any international regime for the former must include

adequate safeguards for the environment as a whole. In addition, it is senseless to enjoin individuals from dumping wastes into the ocean if states themselves are left free to dump anything they please. International regulation of all ocean dumping is necessary if the deterioration of the marine environment is to be checked.

V. OTHER OBJECTIVE CONSIDERATIONS

The marine areas of the earth constitute an environment inherently hostile to man. It is only through the utilization of his technology that man can venture into this environment at all, and only technology can force the seas to give up their resources for his benefit. Technology does not come cheap, however. This is especially true of efforts to extract the mineral resources of the sea-bed, where investments amounting to hundreds of millions of dollars are the general rule. A regime to be established in ocean space, therefore, must be structured in such a way as not to inhibit the economic development of marine resources.

Christy [Ref. 10] has provided an analysis of the economic factors which must be taken into account in devising rules for the governance of deep-sea minerals exploitation. He points out that "common property" resources have traditionally been exploited with considerable economic waste and inefficiency due to the lack of exclusive rights to the resources. La Que [Ref. 91], in evaluating the prospects for deep ocean mining, assumes that even though some deposits of manganese nodules are known to be of higher value than others:

> "Such hot spots probably would be large enough to accommodate a number of exploitation activities simultaneously. This would moderate or even eliminate competition for concessions for exploitation of defined areas."

The latter would imply that exclusive rights are unnecessary.

Such a situation would prove contrary to recent experience with other marine resources. The offshore oil industry has required exclusive rights to petroleum resources from the beginning. Individual companies jealously guard research data on prospective sites, and competition for leaseholds is keen. The same is true of other industries active on the continental shelf. In addition, the recent efforts of coastal states to acquire exclusive fisheries jurisdiction has been noted time and again. Such considerations as nodule assay and density, water depth, proximity to shore support and ore beneficiation facilities, and the size of area necessary for profitable operations are likely to make exclusive rights to certain areas desireable in manganese nodule exploitation as well. Recent public statements by representatives of those firms about to engage in this activity bear this out [Ref. 90].

Besides benefiting the individual, the granting of exclusive operating areas to entrepreneurs also holds certain advantages for society as a whole. By restricting operations to a specified area, interference with other users of ocean space can be minimized. Then, too, efficient exploitation of marine resources would result from requiring the entrepreneur to achieve the maximum yield from his leasehold, rather than indiscriminately exploiting over a wide area. This would avoid the problems experienced with

"common property" resources in the past. Finally, the designation of operating areas would facilitate the fixing of responsibility for environmental damage.

In addition to exclusive rights, a regime for the governance of marine resource exploitation must also supply security of tenure. This is necessary to insure the entrepreneur's ability to make a profit over and above his huge initial investment and operating costs. A secure investment climate is absolutely essential before business will undertake high risk ventures in ocean space.

If an additional purpose of the regime is the collection of revenue from economic rents or taxes on resource production, care must be exercised in the imposition of these fees. Injudiciously high rents, royalties, taxes, work requirements, or other costly obligations may retard development by discouraging commercial enterprises. This fact is often overlooked by those who envision vast sums for international development purposes being derived from a regime for the sea-bed. Without first establishing a favorable investment climate, no income is the more likely outcome.

The common practice in United States offshore oil development has been the sale of leases through competitive cash bidding on tracts designated by the government. In addition to the lease price, the oil companies also pay bonuses based on production. Such methods may be inappropriate for operations in deeper water. Because of the high risk nature of such operations and the huge initial investment required, bids are likely to be extremely low and

bidders few. Then too, production from such activities as manganese nodule mining is likely to be kept quite low to avoid flooding the market and disrupting prices. This would result in low bonus payments.

An alternative system which might prove more appropriate would totally avoid "front end" cash requirements except for a nominal licensing fee. Such a system might require competitive bids for leases based on a percentage of gross or net income gained from the exploitive activity. The first (a percentage of gross income) would constitute a tax on total production. The second would amount to a tax on profits alone. To insure more than token payment to the regime in the early years of deep water resource development, a percentage might be established as the minimum acceptable bid. It might be decided, for example, that 10% of gross or net income was the minimum amount the regime would accept as its "fair share" from the exploitation of manganese nodules.

Such a system based on gross income would promote economic efficiency in the exploitation of marine resources by discouraging from entering bids all but those who felt assured of their ability to exploit economically. In the initial stages of development, however, lack of experience in such high risk ventures might act to deter all bids based on gross income. Since all the first efforts at deep water exploitation will be somewhat speculative in nature, it would appear more logical to extract revenue for the regime from net income. This will, of course, greatly reduce the income accruing to the regime.

Other devices used in the past to promote economic efficiency in minerals exploitation have included rental fees and "work requirements". By the latter, the exploiter is required to meet a certain level of production from his leasehold. Failure to do so results in either penalties or forfeiture of the lease. In applying these methods to deep water operations, care must be exercised to avoid the imposition of too stringent requirements on a technology still in the developmental stage. Reference 50 includes proposed rental fees and work requirements for the exploitation of sea-bed minerals. References 16 and 40 include industry objections and suggested revisions to this proposal. Realistic requirements must be based on sound economic reasoning and the technological realities involved.

VI. ALTERNATIVE SOLUTIONS: PRO AND CON

A. THE PROBLEM - CONCISELY

"Freedom of Access" to marine resources was a workable concept so long as the marine environment was essentially a "no man's land". With more intensive use of this environment and no policeman, "Freedom of the Seas" did not prevent individual states from expropriating specific resources for their exclusive use. A legal concept by itself is not sufficient to regulate activities in what amounts to an organizational vacuum.

Present intergovernmental organizations having interests in marine activities, including agencies of the United Nations and regional groups, exercise no regulatory and enforcement powers respecting such activities. They solely consult and coordinate, without authority to take independent action to assure the rational and equitable development of marine resources. Dependent as they are on the financial support and cooperative action of member governments, they are incapable of providing the strong leadership necessary to resolve the growing problems arising from conflicting interests and environmental deterioration.

The situation on the international scene is analogous to that which existed in the United States prior to 1970. There is no single agency having cognizance over activities in ocean space. Responsibility is split among a number of separate organizations (FAO, UNESCO/IOC, IAEA, regional

fisheries commissions, the U.N. General Assembly, its Sea-Bed Committee, etc.) while any effective international authority is non-existent. Similar circumstances within the United States moved the President's Commission on Marine Science, Engineering and Resources to recommend the establishment of a unified authority to coordinate United States efforts in this area. The National Oceanic and Atmospheric Administration was the result [Ref. 113].

Marine technology, and many other "global technologies" of this century, have widespread effects beyond limits of national jurisdiction. The desire to regulate competing interests and maximize the benefits obtainable from new technology has lead to the formation of such agencies as the International Atomic Energy Agency and the World Meteorological Organization [Ref. 114]. Support for some such solution to marine environmental problems is growing. It is apparent in statements of various delegates to the United Nations, most notably that of Ambassador Pardo of Malta in his communication to the Consultative Assembly of the Council of Europe in December 1970 [Ref. 72]. The International Council of Scientific Unions stated as long ago as 1967 [Ref. 116]:

> "As we see the situation at this time we are convinced that in the long run it will be necessary to combine in one intergovernmental agency most of the functions now carried out in ocean science and technology and the uses of the ocean by many different intergovernmental organizations, together with needed new functions. The international character of the living and non-living resources of the ocean is a compelling factor for thinking in this direction."

There is at least one major difference between marine technology and other global technologies. Whereas atomic energy, for example, holds promise of long term future benefits, the development of marine resources provides direct and immediate economic advantages to groups capable of such activities. It is this instant capture of benefits that has stimulated the expansion of coastal state jurisdiction in recent years. A regime established for ocean space, therefore, must not only promote technological development and environmental protection; it must satisfy apparently divergent political and economic interests of various nationals and states as well.

B. ALTERNATIVE SOLUTIONS

A distinction can be made between possible political/legal regimes and organizational machinery for the regulation of activities in the marine environment. The alternative regimes may be characterized as: 1. Expanded National Domains; 2. Limited International Regulatory Domain; or 3. An Independent Governing Authority for the Ocean. Organizational machinery operative under expanded national domains would be that of the individual states acquiring greater jurisdiction. International machinery could be given any one of a number of forms, with wide variation in discretionary authority. Presumably, only the third solution would reach beyond intergovernmental machinery and attempt to create a distinct ocean authority in juxtaposition to national governments.

The Center for Naval Analyses, in Reference 117, presents an analysis of regulatory regimes for the governance of the expoitation of the sea-bed. The following analysis borrows the basic outline of the alternatives presented in Reference 117, but evaluates them as regards to their acceptability as regulatory regimes for the marine environment as a whole. Many of the considerations, pro and con, enumerated in Reference 117 were also found to be applicable to the more general case considered herein.

1. Expanded National Domain: The National Lakes Approach

The "National Lakes Approach" would represent the ultimate extension of coastal state jurisdiction into ocean space, the territory of one state presumably ending only where it abuts against that of another along a median line between them. Such a system may evolve rapidly through unilateral claims or by the gradual extension of the continental shelf under the "exploitability" principle of the 1958 Convention on the Continental Shelf. In the latter case, the first areas to be affected would undoubtedly be the "internal" and "marginal" seas which are underlain by "continental" crustal material. Once the fever of expanding national claims begins to spread, it will be difficult to suppress efforts to apply the National Lake solution to the oceans as well. The natural tendency on the part of states to convert special interest zones into general interest zones would result in claims to sea-bed jurisdiction being widened to include the superadjacent waters as well.

Factors supposedly favoring such a solution are:

1. It could be implemented immediately, with no necessity of creating new international machinery.

2. Activities within each area would be subject to the jurisdiction of the relevant metropolitan authorities. Those states having efficient administrations could be expected to administer their acquired National Lakes just as efficiently. Entrepreneurs who were nationals of a possessory state would benefit from being able to operate under familiar laws throughout the expanded domain.

3. Each state would have complete jurisdiction over activities off its shores, and could develop marine resources for the maximum benefit of its people. National territorial aspirations would be finally assuaged, and the interests of those internal groups advocating expanded national jurisdiction satisfied.

Disadvantages of such a solution are:

1. It would represent a nadir in international cooperation, with great potential for conflict. International commerce, fishing, scientific research and the operations of naval forces would be seriously restricted, forcing those states deeply involved in maritime activities to take strong measures to protect their interests. A proliferation of divergent national regulations would make the effective management of living resources, the control of pollution and the evolution of a system of ocean forecasting difficult, if not impossible.

2. Many areas would be exploited inefficiently, because a majority of coastal states lack the technology, managerial ability, or capital to do the job properly.

3. Licensed foreign operators in given areas would be liable to arbitrary national actions, including expropriation. Such instability would deter resource development.

4. Such a solution is inequitable. It not only discriminates against land-locked states, but also against many coastal states. In a division based on equidistance, thirteen countries[18] would control approximately two-thirds of the world's ocean area (roughly one-half of the planet) [Ref. 118]. In addition, since marine resources are not evenly distributed throughout the oceans, some areas would be immensely more valuable than others.

2. Limited International Regulatory Domain

a. Flag State Approach

The Flag State Approach, sometimes called the "Right of First Discovery" approach, is actually an extension of the "Right of Capture" principle long applied to the living resources of the sea. Under this system, a state would administer, protect and be responsible for exploitive activity under its registry in a manner analogous to the jurisdiction exercised over ships flying its flag. Because

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[18] They are: "Australia, Brazil, Canada, Chile, Ecuador, France, New Zealand, Norway, Portugal, South Africa, USSR, United Kingdom, United States."

exploitable resources have economic value in their own right, national jurisdiction would extend to the resource or area of operations as well, if for no other reason than the necessity of protecting the proprietary rights of entrepreneurs. Although the administrative machinery would be national, this system is included under the regime of a Limited International Regulatory Domain because it presupposes a region of "International Waters" beyond the jurisdictional limits of coastal states.

The proponents of a Flag State Approach maintain:

1. It is in accord with the principle of "Freedom of Access" and existing international law.

2. This system can be reconciled with existing political/economic systems, and requires no new international institutions or commitments.

3. Exploitation of marine resources has not proceeded to the point where more elaborate systems are necessary.

4. Resources are plentiful, so there's no reason for conflict.

5. Entrepreneurs would operate under the benefit of familiar law.

6. Proprietary information would be protected, it being necessary to release only that required for safety and navigation.

7. Except for the relatively small areas in which exploitation was in progress, there would be no restriction on the traditional "Freedom of the Seas".

Disadvantages of such an approach are:

1. At best, it could be applied only to sea-bed resources found in the deep ocean basins beyond the continental margin. Any attempt to extract the resources of the continental margin of one coastal state, or the sea-bed of "internal" and "marginal" seas, by nationals of another state would establish "exploitability" within the terms of the 1958 Convention on the Continental Shelf. The adjacent coastal state(s) could forthwith legally extend its (or their) jurisdiction over the area to such exploitable depth [Ref. 11].

2. Marine resources are not evenly distributed about the oceans. Variation in economic value will make competition for the highest quality resources inevitable. Competition would result in international tensions similar to those which arise over living marine resources today.

3. Once such a system became entrenched, its benefactors and operators would inhibit efforts to devise more comprehensive international machinery if the latter should prove necessary at a future date.

4. It is inequitable. The technologically advanced states are the only ones who will possess the capability of large scale, diversified exploitation in the foreseeable future. By the time developing countries obtain the means to participate, the most valuable areas would be claimed by others.

5. Many of the problems emerging with respect to the marine environment result from over-reliance

on individual states to police their own activities. The Flag State Approach by itself provides no security for the quality of the marine environment. It provides no guarantee against arbitrary decisions regarding resource development priorities or discrimination vis a vis other users of ocean space. Initiatives would be entirely in the hands of the entrepreneur, be he a state entity or state authorized private person.

b. International Registry Approach

As with the Flag State Approach, the initiative under this system would lie with the entrepreneurs. A flag state, however, would proceed to register its entrepreneur's claim and its own national claim to jurisdiction with an international agency. The agency, on a "first-come, first-served" basis, would then recognize the exclusive rights and jurisdiction of the claimant state in the exploitive area [Ref. 10].

The flexibility of this system is considerable. Various structures are possible, ranging from a "Central Filing Office" with authority only to register claims and collect such fees as are necessary to defray expenses, to an agency with broader powers allowing various degrees of regulatory authority. The distinguishing feature of such an agency, however, would be its total lack of legislative authority. It would have no authority to adopt new rules, but could only interpret those rules set forth in its founding charter.

Advantages of an International Registry Approach are:

1. It is a mixed national/international system which benefits participants without the necessity of large international machinery. The major portion of administrative and regulative tasks are left to national entities. Those functions delegated to the registering agency are clearly within the demonstrated capability of international organization.

2. It would allow exploitation to proceed immediately, while affording a mechanism whereby conflict over resources could be settled peacefully.

3. If the participants choose, a portion of revenues collected by the agency may be contributed to international community purposes.

4. The claims of participating states would have the benefit of international recognition, thus insuring exclusive rights to resources. This would prevent the over-capitalization and congestion that are the bane of common property resources [Ref. 10].

Disadvantages of such an approach are:

1. An International Registry would prove to be of limited usefulness. Recognition of exclusive rights to resources is only one of the problems requiring solution in the immediate future. A registry with limited technical staff and no legislative function would be incapable of administering such new technologies as an environmental prediction service. Additional agencies having cognizance

over other activities (fishing, pollution control, etc.) would be required, resulting in greater fragmentation of responsibility and authority.

2. Such a solution would legitimize extensions of national jurisdiction into ocean space. In addition to broad territorial seas along coastal areas, the world would be covered by a patch-work quilt of national claims in mid-ocean areas. Even assuming that uniform standards for environmental quality accompanied the agreement establishing the registry, it is doubtful that uniform enforcement would result so long as sole responsibility for it rested with individual states.

3. Registration of claims on a "first-come, first-served" basis would constitute a tremendous advantage for developed states having the immediate capability to explore and exploit. Forced to operate under this criterion, the international agency would be powerless to plan a rational development or reconcile conflicting uses of the same area. The system would still be subservient to the entrepreneurs.

4. The competence of such an agency would rest entirely on the foresight of the drafters of the founding charter. Without legislative authority, it would be powerless to react to changes in circumstances or knowledge.

5. The "first-come, first-served" provision does not insure that areas will go to the most efficient producers. If claims were transferable, this could precipitate widespread speculation and a rush to register claims.

If claims were non-transferable, there would be an incentive to produce even though net returns were marginal, in order to preclude loss of the claim [Ref. 10].

c. International Authority Approach

Like the International Registry, an International Authority could assume a wide range of forms, depending on the degree of discretionary powers granted by its charter. Over all, however, it would represent a quantum jump in international cooperative effort.

As generally envisioned, the authority (or agency) would have jurisdiction over the granting of exclusive rights to sea-bed resources. While not empowered to change its founding directive, it would have sufficient legislative authority to enable it to react to changing conditions. The agency would have authority to: grant leases based on competitive bidding or other criteria; prescribe regulations governing exploitation; extract fees and distribute monies over and above its expenses. Depending on its scope of powers, it could also: inspect exploitive activities; take steps to conserve resources and prevent pollution; adjudicate disputes.

Such an agency would not have the authority to undertake independently the exploitation of resources. Exploitive activity would be carried out solely by member states or their nationals. The agency would be further "limited" in that final decisions would be made by the representatives of the member states.

The most comprehensive blueprint for an International Authority which has been advanced is the United States draft treaty on the sea-bed submitted to the United Nations on August 3, 1970 [Ref. 50]. The United States proposal would grant to the "International Seabed Resource Authority" all of the prerogatives enumerated above. The proposed operative machinery is illustrated in Figure 10.

Few changes would be necessary to transform the "Seabed Authority" into what the world seems to need, namely an effective Ocean Authority. For example, the selection of priorities among competing uses in areas where incompatible activities would constitute a problem should be one task added to the "Operations Commission". Such decisions must be based on an analysis of economic and environmental factors involved and not issued arbitrarily. As in the case of all other decisions by the Commissions, appeals may be made to the Tribunal.

A Fisheries Commission should be added. This Commission would coordinate the activities of regional fisheries commissions and the FAO, and otherwise promote the maximum utilization of the living resources of the sea.

A Marine Research Commission would coordinate research activities in physical and geological oceanography, and administer an international environmental data collection and prediction system. Neither this Commission nor the Fisheries Commission described above need engage in research activities directly. They could operate in a manner similar

to the World Meteorological Organization, establishing research priorities and plans to be carried out and financed by national and regional scientific groups.

An Environmental Protection Commission should be established. Although prevention of pollution is one of the objectives of the inspection program of the "Operations Commission", and the monitoring of environmental quality would be possible through an international data collection system, some means of containing and alleviating the effects of pollution once it occurs is necessary. One of the major problems in coping with marine oil spills today is the excessive time lag experienced before necessary equipment and experts are assembled. An International Environmental Protection Commission could administer a system of regionally distributed stockpiles of necessary equipment and supplies. A contingent of experts could be flown to the scene of a pollution incident anywhere in the world in a matter of hours, just as specialists are rushed to the scene of petroleum well fires today. The costs of cleanup operations would be recoverable from the responsible party.

Additional responsibilities of the Environmental Protection Commission could be similar to those of the United States "Council on Environmental Quality" and "Office of Environmental Quality" established by Public Law [Refs. 119 and 120 respectively]. The burden of proof with respect to the possible impact of projected activities on the environment could be shifted to the entrepreneur by requiring

an environmental impact study (similar to that required by U. S. Public Law) prior to granting a license. Such a study should be conducted by a scientist or group of scientists appointed by the Commission, the costs to be shared by the Authority and the entrepreneur.

The voting formula prescribed by the United States draft provides an equitable balance between the interests of developed and developing states. In the Assembly, the principle of "one nation, one vote" applies. In the twenty-four member Council, a simple majority within each member group (the six most industrially advanced states and the eighteen elected states) is necessary to carry a measure. It may prove necessary, however, to provide a means by which the Council can resolve deadlocks between the two voting groups. A three-fourths majority of the total Council membership might prove acceptable.

The United States draft requires that members of the Commissions and Tribunal and the Secretary - General be selected by the Council from a list of nominees provided by the Assembly. Since the authority of the Commissions is considerably increased in the Ocean Authority proposed above, the role of the Council would be the greater. In order to provide a successful system of "checks and balances", it would be more equitable (and, perhaps, attract wider acceptance) if the Tribunal members and the Secretary - General were elected by the Assembly. In the event of death or resignation of a Judge or the Secretary - General between

Assembly sessions, an interim appointment by the Council could be authorized.

The machinery of an International Ocean Authority embodying the above-mentioned modifications to the United States draft sea-bed proposal is depicted in Figure 10.

Advantages of such an approach are:

1. The distribution of wealth from the seas would be equitable. Those states capable of exploiting available resources could begin the necessary tasks, while revenue sharing would benefit disadvantaged states.

2. Since ultimate authority would rest with the member states, an organization responsive to the interests of the community of nations would result.

3. Assuming that a voting formula and method of selecting Commissioners, Judges and Secretary - General as described were adopted, no bloc could dominate the agency.

4. Individual companies could apply for and obtain leases to sea-bed resources.

5. Uniform standards and fees for exploitation anywhere in the international area would be possible.

6. A secure investment climate free from the threat of national expropriation would be established.

7. Control of access through exclusive leases would allow the most efficient and economic exploitation of resources.

8. A strong political entity existing in ocean space would act as a check on national expansionist

tendencies. By providing valuable and necessary services, the Authority would promote international cooperation.

9. A mechanism for the peaceful settlement of disputes in ocean space would be available.

10. International coordination of research and development would make possible planned, controlled use of ocean space, with protection for the environment and the rights of its various users.

Disadvantages of such an approach are:

1. Many nationalists feel such a solution represents a threat to national sovereignty.

2. Unless its functions were carefully managed, such an agency could become overly bureaucratised. Such a result would dissipate funds passionately wanted for international development and other community purposes.

3. The practicality of this solution depends entirely upon where the limit of coastal state jurisdiction is established. Unless coastal state jurisdiction is narrowly limited, there would be little income in the near future to support such an agency.

4. The effectiveness of the agency would depend upon the willingness of the members to accept its decisions.

5. The injudicious imposition of high fees, bonuses, work requirements, etc. would retard resource development.

3. Independent Ocean Governing Authority

An Independent Governing Authority for the Ocean represents the antithesis of the National Lakes Approach. The Authority would own the resources beyond the limits of national jurisdiction, and would exercise complete authority over ocean activities in this area. It would have full legislative powers. Delegates would be responsible to it alone, thereby preventing the member states from dominating the organization.

The organization would be empowered to: plan, coordinate and participate in research and development; inspect and regulate exploitive activities; collect fees and taxes; distribute funds to developing countries; borrow money; settle disputes. In effect, the Authority would constitute a supranational entity.

Figure 11 illustrates the structure of a model proposed by Elizabeth Mann Borgese and Neil Jacoby. The Borgese "Ocean Regime" would grant to an Independent Authority all the prerogatives enumerated above, plus many more. These would include authority to: protect developing countries from the economic effects of market dislocations caused by the exploitation of sea-bed minerals; provide training for scientists and technicians from developing countries; promote better living and working conditions for workers employed by marine industries under its jurisdiction; promote the development of international trade; inspect all sea-bed installations, including military installations;

actively engage in ocean demilitarization negotiations [Ref. 29].

The Borgese proposal provides for a bicameral system of voting in the "Maritime Assembly". The body of states' representatives and whichever other chamber is competent in the matter at issue vote separately. If the two chambers fail to agree, they vote again in joint session. In the latter case a simple majority is sufficient for decision. In the "Maritime Commission" (or governing council) each representative has one vote. Other than for the Regime's development plan and budget, which require a two-thirds majority for passage, decisions in the "Commission" are by simple majority.

Advantages of such an approach are:

1. A comprehensive organization would allow planned, efficient use of ocean space, with the greatest degree of protection for the environment.

2. National expansionist tendencies would be restrained by the existence of a strong regime.

3. Coordinated planning would foster resolution of problems arising from conflicting uses of ocean space.

4. Such an Authority would provide a means for the peaceful settlement of disputes.

5. No bloc could dominate the agency.

Disadvantages of such an approach are:

1. Such an autonomous authority might seek to inhibit or prevent those uses of the sea which it independently opposes (such as military uses).

2. By participating directly in ocean exploitation, the Authority could retard the development of marine resources by discouraging free enterprise and establishing, in effect, a monopoly.

3. Such an agency could easily become a huge, inefficient bureaucracy, with expenses so high that there would be nothing left for developing countries. Any inefficiency would also hinder resource development.

4. 1, 2 and 3 above might well be especially discriminatory against the interests of those developed states extensively involved in marine activities.

5. The voting formula described in the Borgese proposal would allow passage, in the "Maritime Assembly", of measures opposed by the majority of the direct representatives of states or their governments. Such an Authority might presume that it could undertake a policy divergent from the strong desires of member states. Such a solution would be unacceptable at this state in the development of international relations, law and organization.

VII. CONCLUSIONS AND RECOMMENDATIONS

The United States proposal of an "International Trusteeship Zone" for a part of the sea-bed (as noted in Section II, E) is an effort to reconcile the interests of domestic minerals industries (in particular the petroleum industry) as well as attract support from other coastal states with significant continental margins. This proposal would grant to coastal states effective, if not de facto, jurisdiction over the exploitation of the resources of the entire continental margin, while affirming the status of the superadjacent waters as "High Seas". Following the above thesis, this proposal appears undesirable for the following reasons:

1. As long as access to the sea-bed is through the superadjacent waters, there will be a natural tendency to extend jurisdiction upward. This would follow the classic pattern of a "special interest" zone being converted to a "general interest" zone.
2. The proposal runs counter to the growing support among other coastal states for one boundary between national and international jurisdictions. Those states with large coastal fishing interests and little or no continental margin would not be deterred from claiming wide territorial seas.
3. It would grant to coastal states one-third to one-half of the potential revenue to be gained from the exploitation of the continental margin. Those states

having moderate to large continental margins would benefit most. Since this area is the most promising for both petroleum and other development in the foreseeable future, a large reduction in international development funds otherwise accruing to the world community would be the result.

4. Once a coastal state established its effective jurisdiction over the "International Trusteeship Zone" by leasing exploitive activities therein, there is little doubt about what the final disposition of the area would be should the state decide to withdraw from the regime.

5. The proposal divorces the sea-bed from the ocean's ecological and physical system. Split responsibilities and resultant problems of coordination in the "International Trusteeship Zone" would reduce the degree of protection afforded the marine environment. Reconciling conflicting uses of ocean space would be more complicated. Vertical continuity in the marine environment precludes this type of solution. More systematic cooperation in ocean space, not less, is the basic requirement.

6. The stated interest of the petroleum industry in advocating the expansion of national jurisdiction over the resources of the entire continental margin is based on fallacious reasoning. No less secure source of energy could be found than offshore

> petroleum. In the event of conflict, a prime target for an advisary possessing any naval power at all would be the neat complex of oil rigs in the Santa Barbara Channel or off the Texas-Louisiana coast. More secure energy can be found in oil shales within the continental limits. In addition, a proposal which would recognize the jurisdiction of other coastal states over "their" offshore "international trust areas" would subject millions of dollars of American investments, both present and future, to expropriation by other governments.

For reasons of political simplicity and oceanographic reality, a preferable solution would be the establishment of one vertical boundary between the national jurisdiction of coastal states and the "High Seas". In this regard, there is no physical reason for prefering any one depth or distance criterion from another. The distribution of marine resources, however, and their effect on the interests of states will be a deciding factor in this issue. Another major factor will be the degree of involvement of individual coastal states in oceanic activities.

This analysis indicates a majority of states would support relatively narrow limits of national jurisdiction if combined with a strong regime governing the exploitation of the sea-bed beyond. The term "relatively narrow" is used because of the obvious need to satisfy, to some degree, the interests of coastal states in the exploitation of living

and mineral resources off their shores. The following delimitation, based on ideas obtained from Reference 113, is suggested:

1. A twelve-mile territorial sea, coupled with international guarantees of free passage through and over international straits by aircraft and ships on the surface.
2. A contiguous zone out to a water depth of 200 meters or 50 miles from the baseline used to determine the territorial sea, whichever is farthest seaward. In this zone the coastal state would have:
   a) jurisdiction over the exploitation of the mineral resources of the sea-bed and its subsoil;
   b) exclusive fisheries jurisdiction subject to the maintenance of historic fishing rights and non-discrimination against any state in the granting of licenses to foreign fishermen; (If desired, a provision could be included whereby the coastal state might "buy" the historic rights of other states by payment of, for example, ten times the current value of their catch.)
   c) the right to full participation in, and access to, the results of all scientific research;
   d) limited jurisdiction for purposes of customs, immigration and the control of pollution; (The last to be subject to international regulations for the control of pollution and not purely arbitrary on the part of the coastal state.)

e) the right of hot pursuit as guaranteed by Article 23 of the 1958 Convention on the High Seas [Ref. 106].

As indicated in Table I, the twelve-mile territorial sea already has wide acceptance, only 13 of 112 states presently claiming more. A contiguous zone out to a depth of 200 meters or distance of 50 miles would represent a compromise between the interests of coastal and land-locked and shelf-limited states. The area of sea-bed removed from the jurisdiction of an international regime would be less than one-half that removed by a general 200 mile limit or a regime under which coastal states acquired effective jurisdiction over the entire continental margin [Ref. 78, 117]. Areas favorable to petroleum development would be included under the international regime, thereby increasing potential revenue for international development purposes.

The minimum area accruing to any coastal state for the exploitation of marine resources off its coast would be 50 miles. This would be more equitable to those states with little or no continental margin than a delimitation based on depth alone. Since the 1958 Convention on the Continental Shelf established 200 meters as the minimum extent of shelf accruing to the adjacent coastal state, those states whose shelves reach a depth of 200 meters farther than 50 miles from shore would oppose an attempt to retire the boundary to that distance. The dual criteria, therefore, represents the best compromise obtainable.

Such a boundary delimitation would benefit developing coastal states by allowing them ample room for the development of domestic fisheries and for direct leasing of minerals exploitation. Developed coastal countries would benefit additionally from the narrow limit to the territorial sea and uniform international regulations for the control of ocean pollution. Distant water fishermen and oceanographic research vessels would have more freedom than would be possible under a general 200-mile territorial sea or would likely result, in practice, from the national administration of "international trust areas".

It is believed that such a proposal could achieve the international support necessary for adoption at the 1973 Conference on the Law of the Sea. As previously stated, however, the general acceptability of relatively narrow limits to national jurisdiction is contingent upon the establishment of a strong international regulatory regime for the area beyond national limits. Based on this criterion, the only regime which would satisfy political and economic realities sufficiently to attract widespread support among the nations is an International Ocean Authority of the character depicted in Section VI B-2(c). Such a regime, responsible to its member states, yet encompassing the creditable technical competence and authority to coordinate the rational development of all marine resources beyond narrow limits of national jurisdiction, could yield great benefits in the immediate future.

Opposition to such a solution on the grounds that it constitutes a threat to national sovereignty is mistaken. An International Authority would respect national sovereignty, giving each nation a voice in the governance of ocean space which it doesn't presently have. The true threat to national sovereignty is the breakdown of the principle of "Freedom of the Seas" which is an inevitable result of more intense use of ocean space. Should the unimpeded expansion of coastal state jurisdiction continue, incidents of conflict between incompatible uses of the same space are bound to increase. The best hope for replacing international tension with international cooperation is a strong International Authority providing a wide range of valuable services.

Fears that an International Authority of the type described would inevitably become an unwieldy bureaucracy are unfounded. The incentive is to insure just the opposite: a streamlined, efficient administration with low operating costs which would not diminish funds available for international development purposes. As previously stated, the International Authority should coordinate and plan research projects, leaving the execution and financing to national and regional scientific groups. With regard to operative responsibilities, such as pollution control and the international data collection and prediction system, maximum advantage should be taken of contractural arrangements. Such techniques would substantially limit the size of staff.

Establishing the limit of coastal state jurisdiction at 200 meters depth or 50 miles will preclude in the immediate future any huge inflow of revenue from the exploitation of petroleum and other shelf resources. This is not to say that the Authority would face bankruptcy. Income from the exploitation of such resources as manganese nodules is likely to be available by the time the Authority is operational. Nor are sea-bed minerals the only potential source of funds. It is recommended that additional income be obtained from a subscription fee for environmental forecasting services. Shipping companies, fishermen and national governments, to name only a few, are all potential users of this valuable service. A nominal tax on the value of fish and other living resources harvested beyond the limits of national jurisdiction is also recommended.

Turning to the subject of taxes and fees, care must be exercised lest these be injudiciously high, especially in the early stages of speculative ventures. They should be structured to promote early development, with international revenue a secondary objective. Such a policy would yield much greater long term benefits. The requirement, in the beginning, that a percentage of net income from sea-bed exploitation be paid to the International Authority is considered to be the most equitable solution.

Since international development funds are likely to be limited at first, they should be used to promote ocean-oriented activities, such as the development of fish protein

concentrates, which could alleviate malnutrition. Rather than penalize those states engaged in the exploitation of sea-bed minerals by attempting to manipulate market prices, special consideration for those states whose economies are dependent on land derived minerals should take the form of assistance toward greater economic diversification.

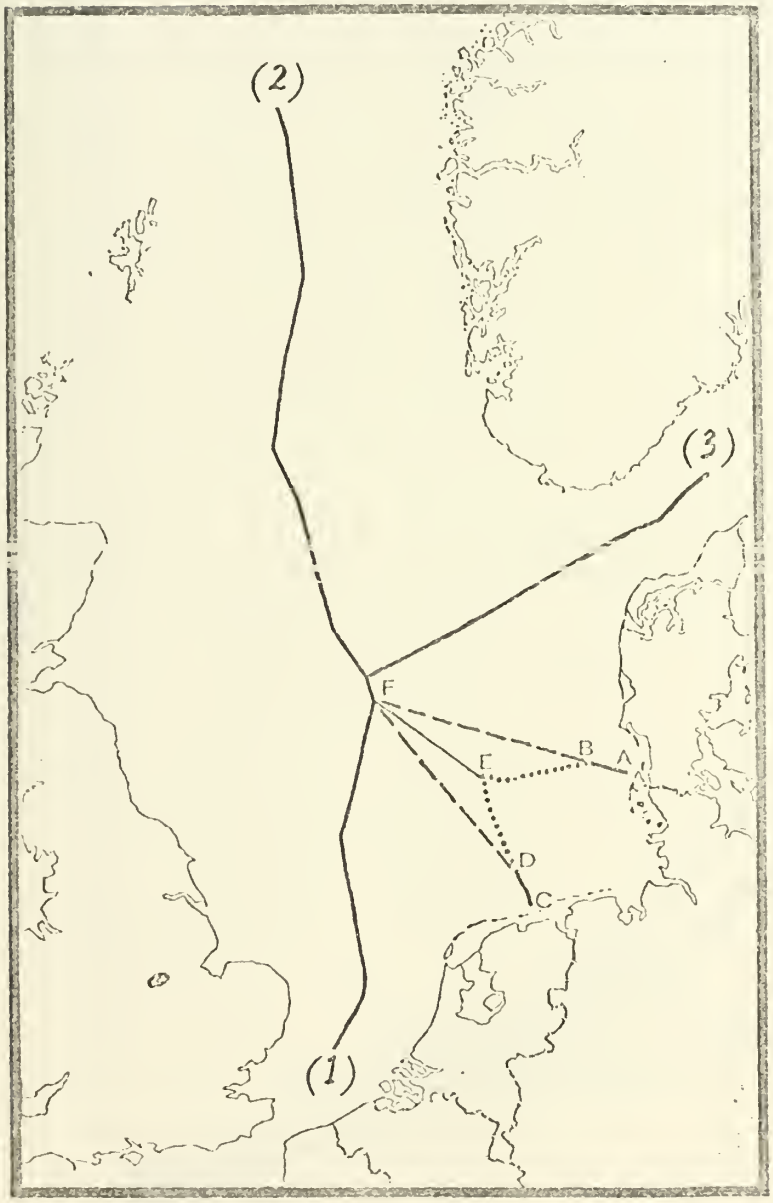
The United States has stimulated action on the international scene by advancing the most thorough proposal to date for a sea-bed regime. As pointed out herein, however, an imaginative sea-bed proposal standing alone is not an adequate or acceptable response to the broad range of problems currently plaguing the oceans. Only by a comprehensive approach can the true potential benefits to be gained from the marine environment be realized. The United States should seize the initiative now, accept a compromise on national interests and assume a new policy of "moral leadership" on this critical issue. By so doing, the country may reap diplomatic as well as material benefits extending far beyond the present decade.

APPENDIX A

Figure 1 - NORTH SEA

CONTINENTAL SHELF LITIGATION CHART*

(Ref. 13)



Lines 1-2 and 1-3

Median lines reached by agreement among Great Britain, Norway, Denmark and the Netherlands.

Lines A-B and C-D

Partial boundary lines established by agreements of 1 December 1964 between Germany and the Netherlands and of 9 June 1965 between Germany and Denmark.

Lines D-E and B-E

The equidistance lines at issue in the case.

Line E-F

Proposed line dividing the claims of Denmark and the Netherlands, assuming the validity of lines D-E and B-E.

Lines B-F and D-F

The boundary lines claimed by Germany during its negotiations with Denmark and the Netherlands.

*Reprinted, with modifications, from the decision of the Court, [1969] I.C.J. 3, 15.

Figure 2: History of Domestic Offshore Activity (Ref. 19)

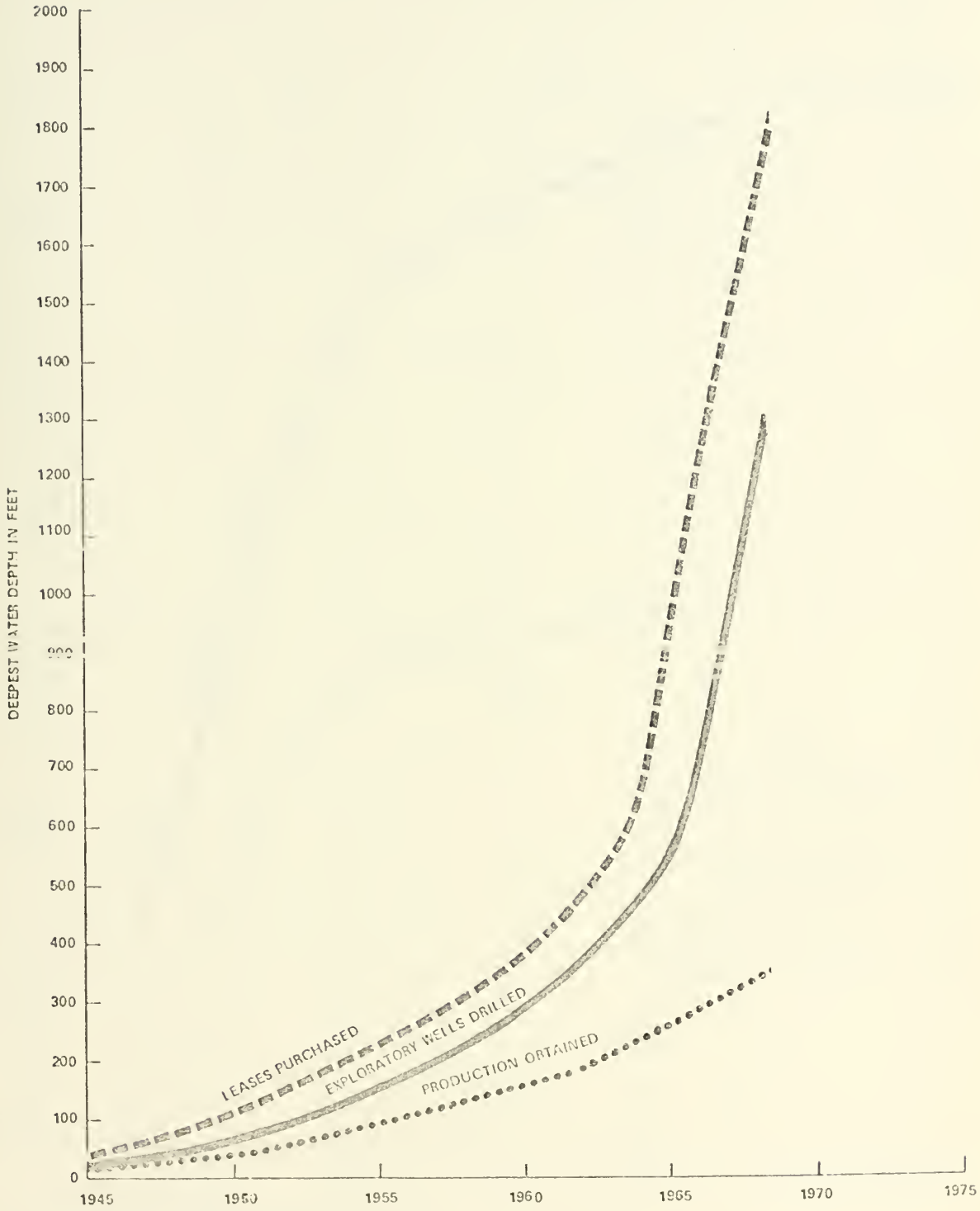
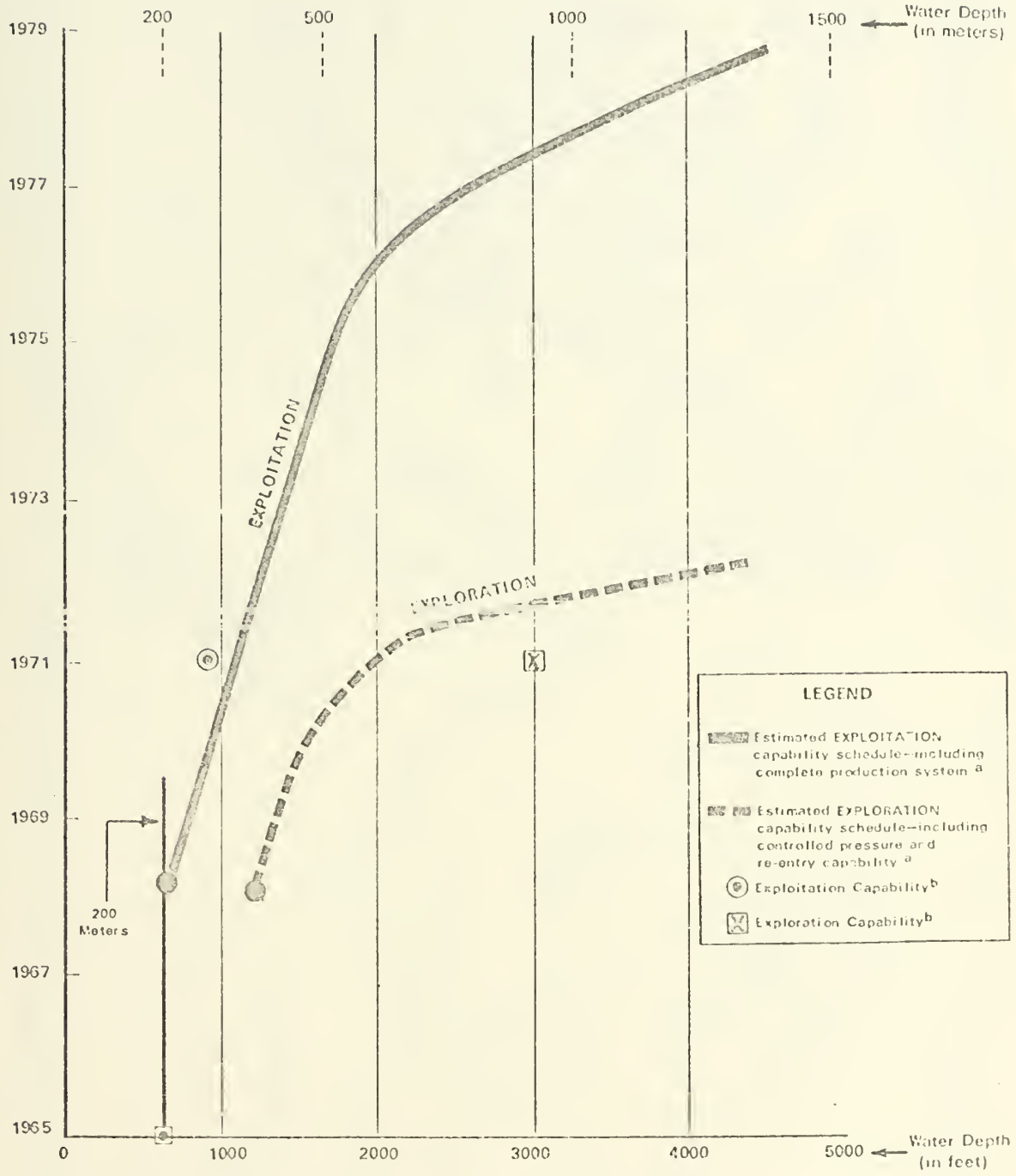


Figure 3: Estimated Rate of Extending Exploration and Exploitation Capability Offshore (Ref. 19)



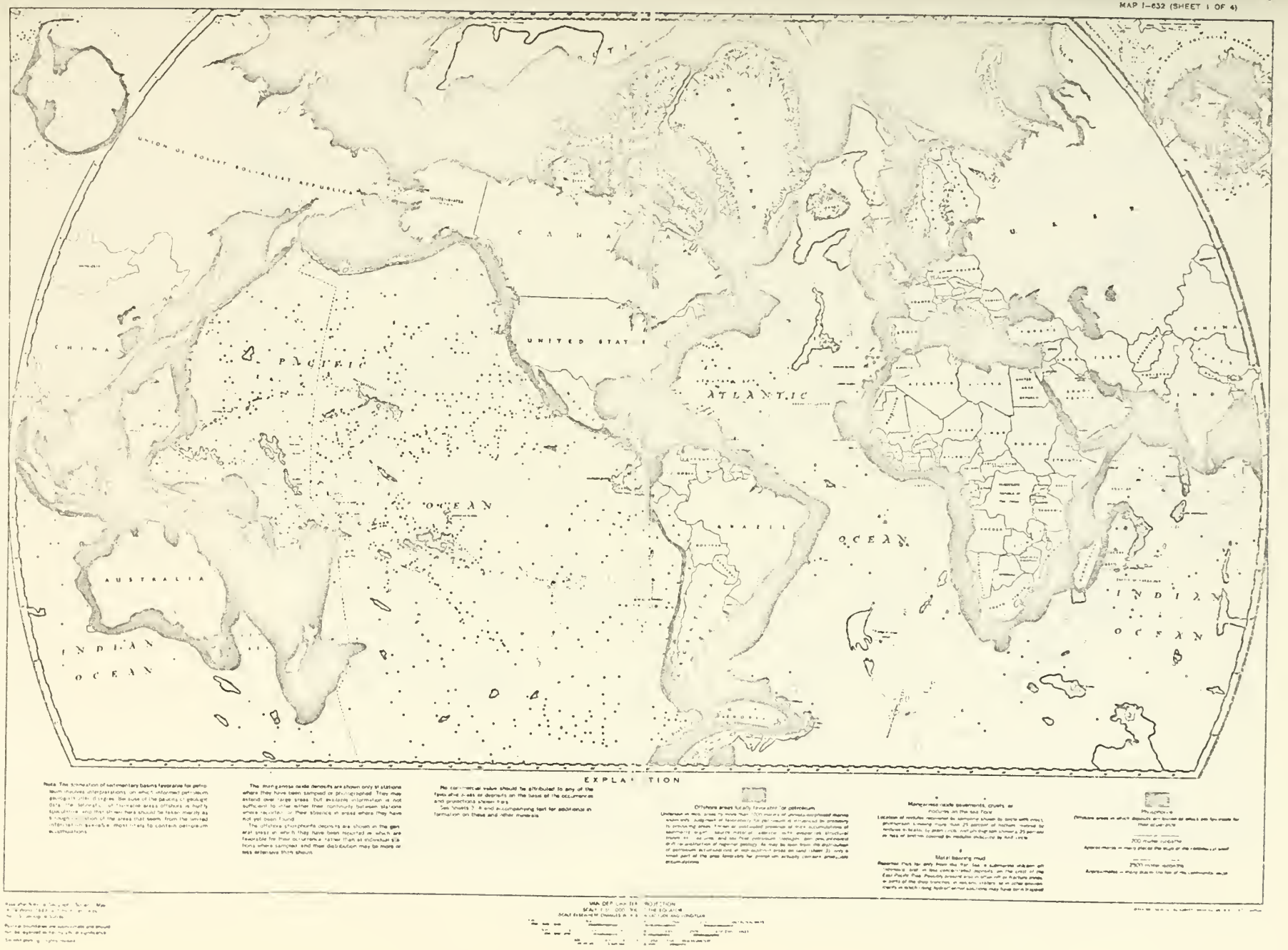
[a] NPC Committee estimates

[b] R. J. Howe, "The Evolution of Offshore Mobile Drilling Units," *API Drilling & Production Yearbook* (1966).

Figure 4 - GLOBAL EFFECT OF 200 NAUTICAL MILE TERRITORIAL SEA CLAIMS

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

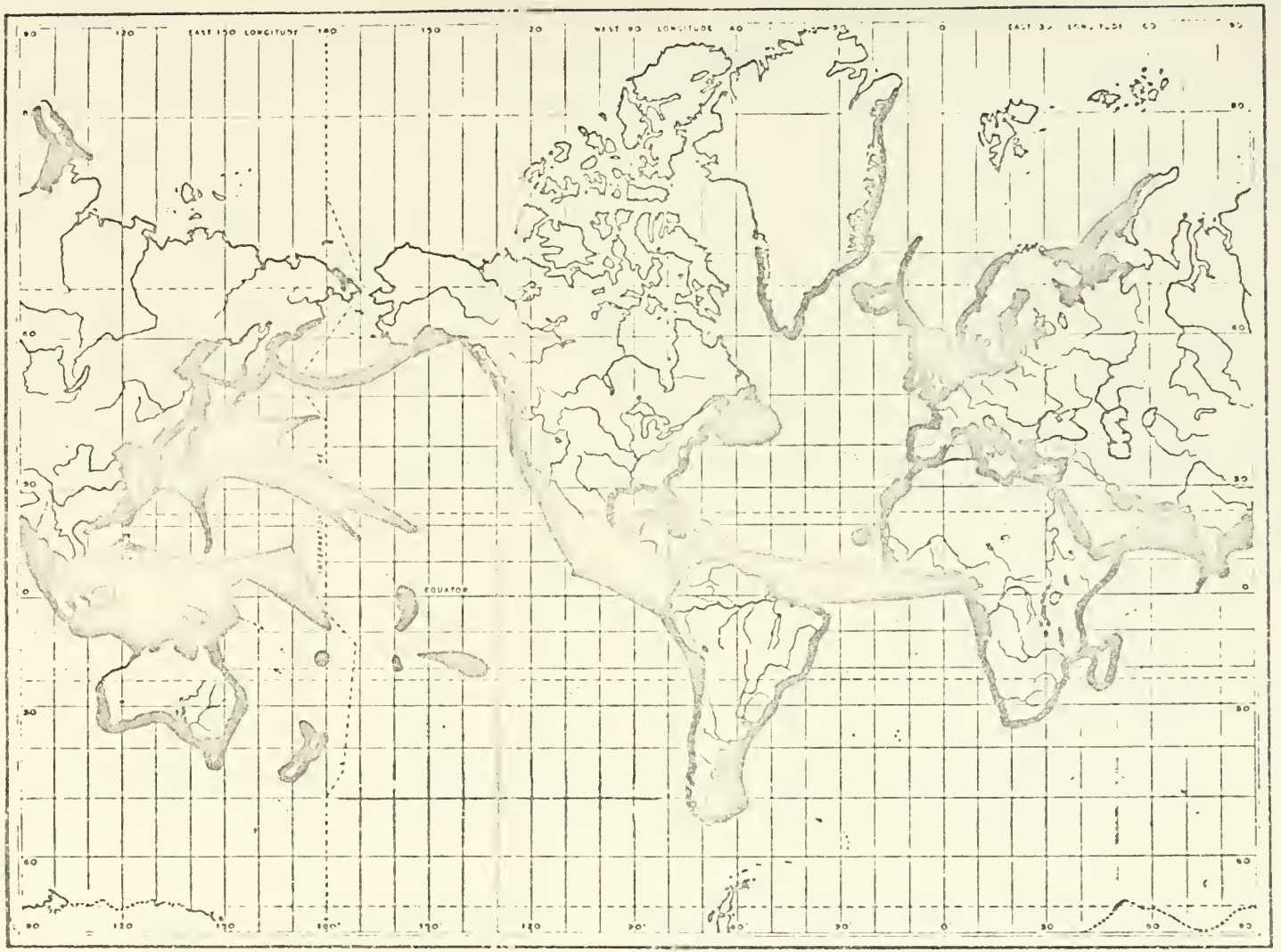
MISCELLANEOUS GEOLOGIC INVESTIGATIONS
MAP I-632 (SHEET 1 OF 4)



Preliminary Map
Petroleum, phosphorite, manganese-oxide nodules, and metal-bearing mud

Figure 5 - WORLD SUBSEA MINERAL RESOURCES

Compiled by
V. E. McKelvey and Frank F. H. Wang



Source: Compiled from many sources.

FIG. 6 - PRINCIPAL OCEAN FISHING AREAS (Ref. 115)

Figure 7 - FORMULATION OF "AMERICAN" INTERESTS

LIMITS OF NATIONAL JURISDICTION	COASTAL FISHING	DISTANT FISHING	PETROLEUM	MINING	MERCHANT SHIPPING	SCIENTIFIC RESEARCH	ENVIRONMENTAL QUALITY	FRONTIER SECURITY	MILITARY STRATEGY	FOREIGN AFFAIRS
NARROW		X			X	X			X	X
BROAD	X		X	X			X	X		

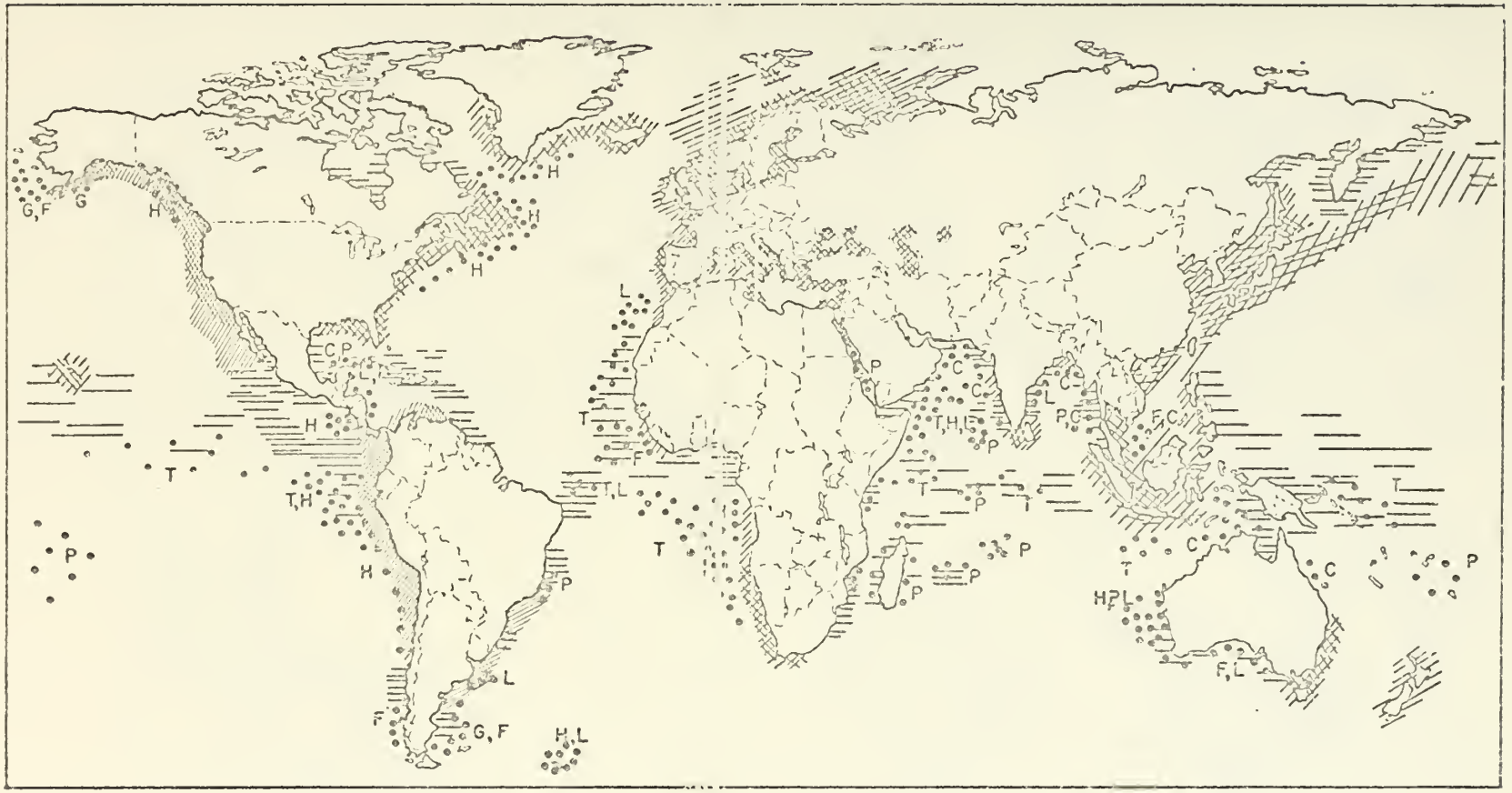


Figure 8: Present intensity of world fishery and underexploited resources (Ref. 97)

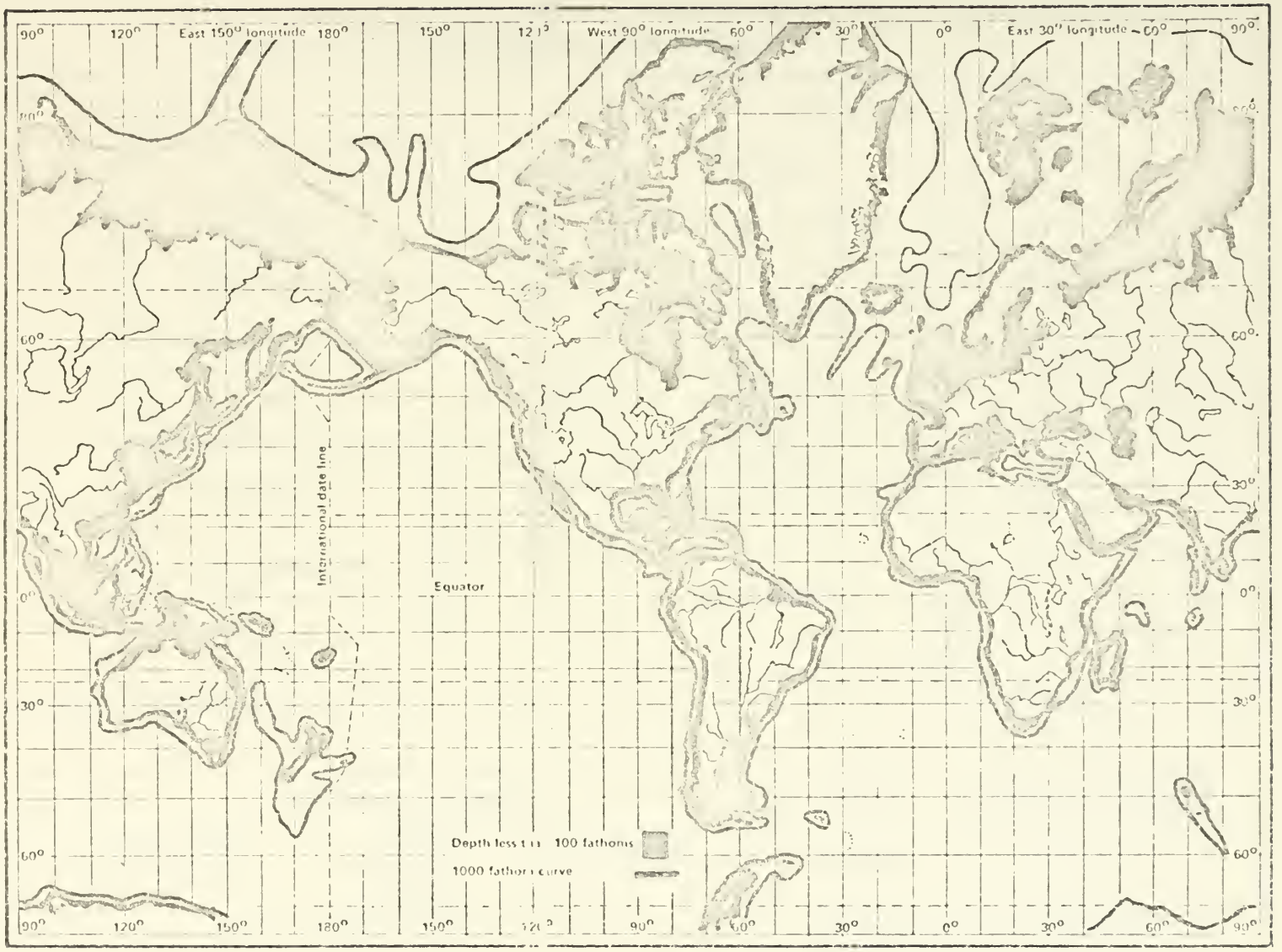


FIG. 9: SHALLOW WATER AREAS (Ref, 78)

Figure 10 - INTERNATIONAL OCEAN AUTHORITY

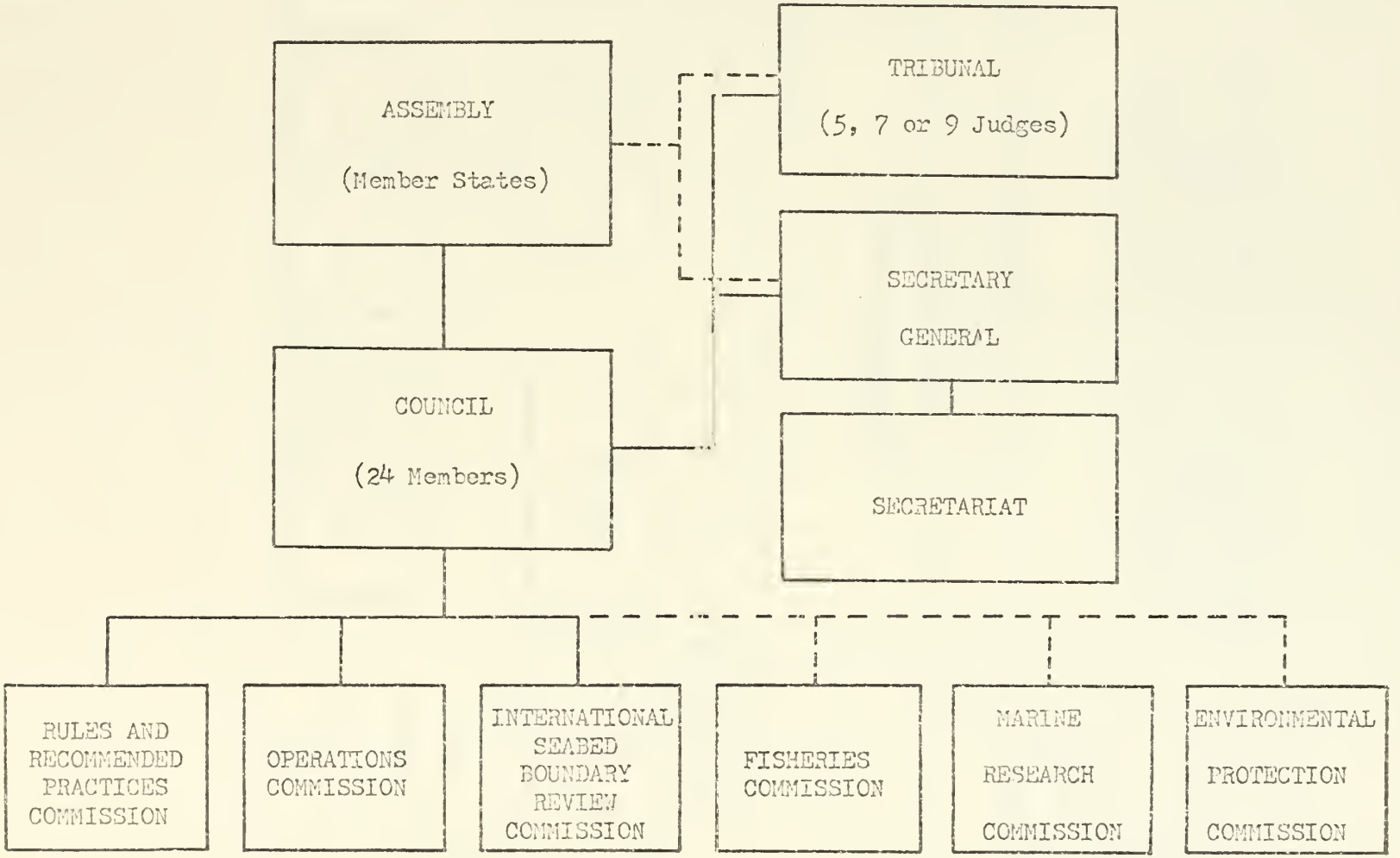
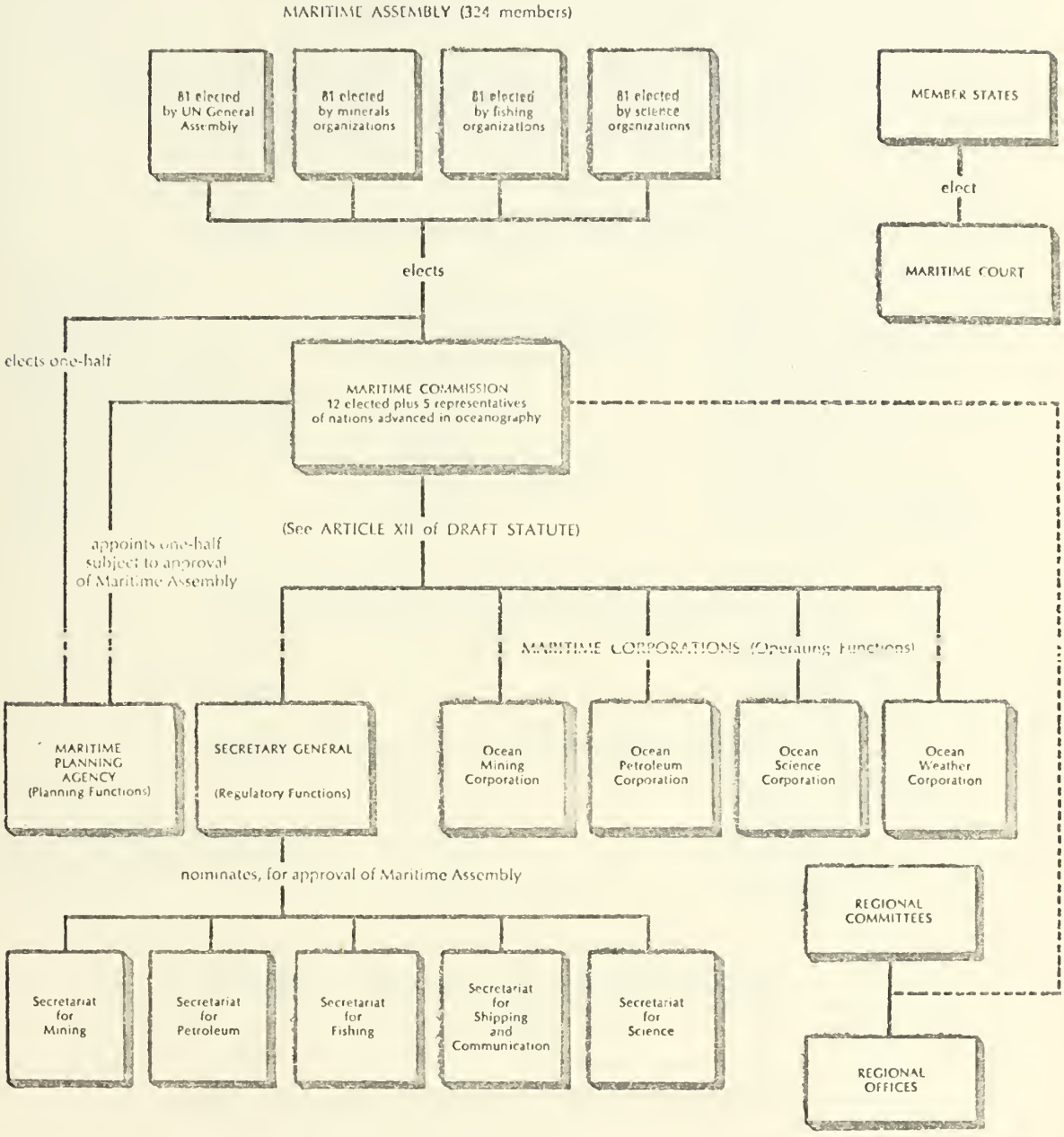


Figure 11 - ORGANIZATION OF THE OCEAN REGIME (Ref. 27)

(merged Borgese-Jacoby models)



APPENDIX B

TABLE I

TERRITORIAL SEA CLAIMS

(Based on listing compiled by the Office of the Judge Advocate General of the Navy 14 October 1970 and Reference 3)

STATES CLAIMING 3 NAUTICAL MILES - 30

Australia	France	Muscat & Oman
Barbados	Germany (East)	Nauru
Belgium	Germany (West)	Netherlands
China (Taiwan)	Guyana	New Zealand
Congo (Brazzaville)	Ireland	Poland
Congo (Kinshasa)	Japan	Singapore
Costa Rica	Jordan	Tonga
Cuba	Korea (South)	United Kingdom
Denmark	Malta	United States
Fiji	Morocco	Viet-Nam (South)

STATES CLAIMING 4 NAUTICAL MILES - 4

Finland	Norway
Iceland	Sweden

STATES CLAIMING 6 NAUTICAL MILES - 13

Ceylon	Haiti	South Africa
Dominican Republic	Israel	Spain
Equatorial Guinea	Italy	Tunisia
Greece	Ivory Coast	Turkey
	Portugal	

STATES CLAIMING 10 NAUTICAL MILES - 1

Yugoslavia

STATES CLAIMING 12 NAUTICAL MILES - 51

Albania	Ghana	Libya
Algeria	Guatemala	Malagasy
Bulgaria	Honduras	Malaysia
Burma	India	Maldive Islands
Cambodia	Indonesia#	Mauritania
Canada	Iran	Mauritius
China (Communist)	Iraq	Mexico
Colombia	Jamaica	Monaco
Cyprus	Kenya	Nigeria
Dahomey	Korea (North)	Pakistan

Ethiopia	Kuwait	Romania
Gambia	Liberia	Saudi Arabia
Senegal	Tanzania	United Arab Republic
Sierra Leone	Thailand	Venezuela
Somalia	Togo	Viet-Nam (North)
Sudan	Trinidad & Tobago	Yemen
Syria	USSR	Southern Yemen

STATES CLAIMING 20 KILOMETERS - 1

Lebanon

STATES CLAIMING 18 NAUTICAL MILES - 1

Cameroon

STATES CLAIMING 25 NAUTICAL MILES - 1

Gabon

STATES CLAIMING 130 NAUTICAL MILES - 1

Guinea

STATES CLAIMING 200 NAUTICAL MILES - 9

Argentina*	Ecuador	Panama
Brazil	El Salvador	Peru
Chile	Nicaragua	Uruguay*

NOTES

1. Philippines: Subscribes to Archipelago Theory - "Waters within straight lines joining appropriate points of outermost islands of the archipelago are considered internal waters; waters between these baselines and the limits described in the Treaty of Paris, December 10, 1898, the United States-Spain Treaty of November 7, 1900, and the United States-United Kingdom Treaty of January 2, 1930, are considered to be the territorial sea". (Office of JAGN).

Indonesia: Subscribes to Archipelago Theory - Twelve mile territorial sea measured seaward from straight baselines connecting the outermost islands. (Office of JAGN).

* Argentina: "By law of 29 December 1966, sovereignty was claimed over a 200 mile zone, but freedom of navigation of vessels and aircraft was not curtailed. It is not clear whether or not this is a territorial sea claim in extension of the previously claimed 3 mile limit". (Office of JAGN).

Uruguay: "Law of 3 December 1959, claims a 200 mile territorial sea, but specifically guarantees freedom of navigation and overflight in the area beyond 12 miles." In the 12-200 mile portion of the territorial sea only foreign fishing is restricted. (Office of JAGN).

TABLE II

LAND-LOCKED AND SHELF-LIMITED STATES - 55

Afghanistan
Andorra
Austria
Barbados
Bhutan
Bolivia
Botswana
Burundi
Byelorussian SSR
Central African Republic
Chad
Congo (Brazzaville)
Congo (Kinshasa)
Cyprus
Czechoslovakia
Dahomey
Equatorial Guinea
Fiji
Gambia
Hungary
Iraq
Israel
Jamaica
Jordan
Kuwait
Laos
Lebanon
Lesotho
Liechtenstein
Luxembourg
Malawi
Mali
Maldive Islands
Malta
Mauritius
Monaco
Mongolia
Nauru
Nepal
Niger
Paraguay
Rhodesia
Rwanda
San Marino
Singapore
Swaziland
Switzerland
Syria
Togo
Trinidad & Tobago
Uganda
Upper Volta
Vatican City
Western Samoa
Zambia

STATES HAVING COASTS AND CONTINENTAL MARGINS OF MODERATE SIZE - 41 (Less than 50,000 square nautical miles at depth less than 200 meters)

Algeria
Cambodia
Cameroon
Ceylon
China (Taiwan)
Colombia
Costa Rica
Dominican Republic
El Salvador
Gabon
Ghana
Greece
Guatemala
Guinea
Guyana
Haiti
Honduras
Iceland
Ireland
Ivory Coast
Kenya
Liberia
Libya
Mauritania
Morocco
Muscat & Oman
Nicaragua
Nigeria
Norway
Panama
Pakistan
Senegal
Sierra Leone
Somalia
Southern Yemen
Spain
Tanzania
Tunisia
United Arab Republic
Uruguay
Venezuela

STATES WITH LONG COASTS BUT LITTLE OR NO CONTINENTAL MARGINS - 3

Chile
Ecuador
Peru

ARCHIPELAGIC STATES (Suscribing to Archipelago Theory) - 2

Indonesia
Philippines

STATES WITH LONG COASTS AND SUBSTANTIAL CONTINENTAL MARGINS - 22 (More than 50,000 square nautical miles at depth less than 200 meters)

Argentina
Australia
Brazil
Burma
Canada
China (Communist)
Cuba
Denmark (including Greenland)
France (including dependencies)
India
Japan
Malagasy Republic
Malaysia
Mexico
New Zealand
Portugal (including dependencies)
South Africa
Thailand
USSR
United Kingdom (including dependencies)
United States
Viet-Nam (South)

STATES BORDERING ON "INTERNAL SEAS" - 22

Albania
Belgium
Bulgaria
Ethiopia
Finland
Germany (East)
Germany (West)
Iran
Italy
Korea (North)
Korea (South)
Netherlands
Poland
Rumania
Saudi Arabia
Sudan
Sweden
Turkey
Ukrainian SSR
Viet-Nam (North)
Yemen
Yugoslavia

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13. ABSTRACT

Under pressure of more intensive and diverse uses, the legal principle of "Freedom of Access" to marine resources is no longer sufficient to regulate man's activities in the marine environment. An analysis of the factors which must be considered in designing a workable regime for the future exploitation of the ocean was conducted. Oceanographic as well as political and economic factors are examined, and alternative solutions evaluated as to their ability to satisfy various interests and objective considerations. A recommended formula for the delimitation of coastal state jurisdiction in ocean space and a proposed structure for an International Ocean Authority to regulate activities in the area beyond national jurisdiction are advanced.

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